

Block

5

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MDE-417: Distance Education: Economic Perspective

(New Course in place of ES-317: Distance Education: Economic Perspective)

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MDE-417: Distance Education: Economic Perspective

Course Outline

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 - Unit 6 : Activity-Based Costing Models for Alternative Modes of Delivering On-Line Courses (*Chris Garbett*)
 - Unit 7 : Private Cost of Education: A Comparative Study of Distance and Campus-based University Students in Nigeria (*Felix Olakulehin & Santosh Panda*)
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INTRODUCTION TO THE BLOCK

This is the fifth and final Block of Course MDE-417. We have selected eight articles/research papers relating to the field of ‘economics of distance education’, and which shall further explain and add to a comprehensive view of what you have read in the preceding four Blocks. In addition to this readings of papers, you may like to consult a recent work in this area: Bramble, W.J. & Panda, S. (Eds.) (2008). *Economics of Distance and Online Learning: Theory, Practice and Research*. New York: Routledge for further study.

While the first two papers (Unit 1 and Unit 2) articulate the conceptual and practical dimensions of this area of study and engage us in taking a comprehensive view of many inter-related themes and dimensions, the rest of the six papers (Units 3 to 8) provide analysis in respective sub-areas based on data collected from the field. These deal with: teacher education, networked learning, return on investment (ROI), activity costing (ABC), private cost of education, and cost analysis in a mega open university.

While the assessment strategy (i.e. assignments and examinations) will not be based on any individual paper included in this Block, the reading of these papers shall facilitate you to respond to assignments and term-end exam questions at a higher analytical and comprehension level, and with greater conceptual clarity.

THE PEOPLE'S
UNIVERSITY

UNIT 1:

THE ECONOMICS OF MASS DISTANCE EDUCATION

GREVILLE RUMBLE

[In Rumble, G. (Ed.). (2004). *Papers and Debates on the Economics and Costs of Distance and Online Learning*. Oldenburg: Carl Von Ossietzky University) (Reprinted by permission).]

There is a belief that distance education is cheaper than traditional forms of education. What is usually meant by this is that the cost per student and/or per graduate is less than in traditional forms of education. Since students can progress at different rates (either full-time or part-time), the cost per student is often expressed in some kind of standard measure such as the cost per student-hour or cost per full-time student equivalent.

It is not always easy to compare the costs of distance and traditional systems. They may have different objectives; they may teach different subjects or the same subjects in very different ways; the previous educational qualifications of the students entering the systems may be different, and this may affect their success in producing graduates; and the quality of the teaching may be different. Any one of these variables may affect costs and the way we view them. Generally, however, cost comparisons are confined to institutions teaching at the same level (primary, secondary or tertiary) and the assumption is made that the quality of education offered is similar.

Of course, distance-education systems are not set up just because they are believed to be cheaper. However, cost is an important factor, and those responsible for their establishment rightly point out that they can be cheaper. The organizing committee of the Venezuelan Universidad Nacional Abierta stated its belief that the institution would 'contribute in significantly reducing the annual cost per student and the social cost per graduate' (COUNA, 1979). The Andhra Pradesh Committee on the Establishment of an Open University (1982) cited evidence drawn from early cost studies of the British Open University to the effect that the average recurrent and capital cost per student in the latter was less than that found in conventional British universities, and implies that the foundation of a distance-teaching university in Andhra Pradesh would be cheaper than any alternative course of action open to the state government.

Unfortunately the hopes of politicians and planners are not always realized. There are examples of distance-teaching schemes where the cost per student or cost per graduate, and sometimes both, have been higher than costs in traditional systems doing comparable tasks, just as there are plenty of examples of distance teaching systems which have been cheaper (Perraton, 1982).

The cost structures of distance and traditional education are so different that those setting up distance systems experience considerable difficulty in describing the operation and economics of their institution to officials in government and funding agencies (Snowden and Daniel, 1980).

To understand why this is so, and why distance systems may be both cheaper and more expensive than traditional ones, it is necessary to have some knowledge of the way educational costs behave.

The basic cost function

The total costs of an enterprise are made up of both fixed and variable costs. Fixed costs do not vary continuously in relation to changes in volume of activities, although they may change if activities are ended or if there are very significant changes in volumes. (What is a significant change in volume needs to be defined within the context of the enterprise.) Variable costs tend to increase or decrease directly (linearly) with fluctuations in the value of activity.

The basic cost function for any educational system is

$$T = S\Omega + C\delta + P\pi + F$$

Where T is the total cost, S is the number of students, C is the number of courses which are being developed, P is the number of courses being presented to students, F is fixed cost of the system (administrative costs and other overheads), Ω is the direct cost per student, δ is the direct cost of developing a course, and π is the direct course-related cost of presenting a course. The total direct cost of teaching students is $S\Omega$, the total direct cost of courses in development $C\delta$, and the total direct cost of courses in presentation is $P\pi$. The variables for which volumes of activity are identified here as being of significance are S , C and P . There may be others which are of importance in particular distance-education systems: for example, the number of local study centres at which teaching takes place. However, the model used in this article ignores the influence of other variables. All the costs on the right hand side of the equation are dependent on management choice.

In distance-education systems, student-related costs include the costs of materials supplied to students, the costs of distributing materials where these are sent to each student the costs of paying tutors to mark students' assignments and examination scripts, and the costs of any face-to-face tuition. Obviously, the cost per student goes up if one gives students more rather than less material, while the cost per student of tuition, for example, will vary depending on the amount of tuition given and the student/tutor ratio.

The direct costs of developing a course will include labour costs (payments to authors, editors, designers, broadcast producers) as well as the development and production costs of producing 'master copies' or prototypes of course materials (for example, payments of consultants, payment for rights, cost of editing broadcasts and preparing master tapes, etc.) way a cost behaves can be changed by management decision. The cost of producing copies of the materials which are given to the students is a direct student cost, while the cost of producing a stock of materials which one lends to students while they are registered on a particular course is a direct course cost. For example, if one gives students the video-cassettes associated with a course, the cost of this copy is a direct cost which is incurred for each student, then the cost of the stock of copies is a direct cost of the course.

The direct course-related costs of presenting a course include such items of expenditure as the cost of transmitting broadcasts associated with the course, re-writing examination questions, monitoring the course, and generally updating and clarifying the materials.

Overhead costs are more or less self-evident, covering the costs of management functions (personnel, finance, management services, administration, institutional planning and evaluation, etc.). The more sophisticated the management and control system, the greater these costs are likely to be. Overhead costs may also include an allowance for the replacement of capital (studio and transmission equipment, computers, etc.), all of which will in due course wear out and need to be replaced. There are a number of ways of treating capital costs, but for practical purposes what is really important is the cost to the enterprise of replacing the capital item when it is worn out with a new item which will fulfil a similar function.

The use of media and the problems of managing distance-taught students means that the overhead costs of the institution (F), the costs of developing a course (δ), and the course-related costs of presenting courses (π), are in general higher in distance teaching institutions than in traditional institutions with comparable student numbers. However, the relatively limited amount of support given to student means that the direct cost per student (Ω) is lower. This is because much of the managerial and academic effort of the institution is being put into the development and maintenance of educational material and administrative systems for the control of distance students. This then represents a form of capital investment which replaces direct-student-teacher contact, and which can be used to teach many times numbers of students that can be catered for in such traditional forms of education as the (face-to-face) lecture, seminar and tutorial. In essence, capital replace labour, offering to educationists what Wagner (1982) described as 'a mass production alternative to the traditional craft approach'.

The extent to which fixed (capital) costs can predominate in distance education was shown in a comparative study of the costs of course at conventional British universities and at the distance-teaching Open University: whereas the ratio of variable to fixed course costs at conventional British universities was about 1:8, at the Open University it was about 1:2,000 (Laidlaw and Layard, 1974).

The Costs of developing, producing and distributing course materials

A particular feature of distance-education systems is the level of investment required in the system before a single student can be enrolled. The investment in capital items (buildings, equipment, etc.) can be considerable, particularly if studio-based technologies and satellite or terrestrial broadcasting are used, and these facilities have to be built, as opposed to being hired as required. Use of computer-based technologies for teaching and administration also adds significantly to cost. Provision needs to be made for the warehousing and handling of course materials, so warehouses may have to be built and will certainly need to be equipped to meet the institution's needs. Additional costs will be incurred if it is decided to set up an in-house print shop rather than use existing commercial printers.

A range of course materials sufficient to meet the academic objectives of the institution and provide potential students with an element of choice has to be designed and produced. The most significant cost here is likely to be the cost of the academic and related staff required to develop the materials. Sparkes (1984) has suggested that whereas it takes from 1 to 10 hours of staff time to develop one hour of small group teaching, and from 2 to 10 hours to prepare a one-hour lecture, it will take from 3 to 10 hours to prepare one hour of tutored video instruction (TVI), 50 to 100 hours to prepare a teaching text which will occupy a student for one hour, 100 hours or more to develop a 'broadcast quality' 60-minute television programme, 200 hours or more to prepare one hour's worth of computer aided learning, and 300 hours or more to prepare one hour's worth of material on interactive video-disc.

These figures need to be treated with some care. Broadly, speaking, there are four approaches to the creation of distance learning materials. The first of these is to look around for some existing material which can be used either as it stands or in adapted form to meet the needs of distance-taught students. It is quite common, for example, for an institution to recommend certain textbooks to its students, which they are then required to buy in order to take the course. Obviously, this vastly reduces the costs of the institution, which then only has to prepare a few notes of guidance and some assessment questions in order to begin teaching. This approach involves hardly any creative effort on the part of the teaching institution, and is a very cheap way of proceeding. It is used by some commercial correspondence colleges preparing students for professional and other examinations. It rarely produces good self-instructional teaching materials, but it does allow a wide range of course to be developed at very little cost. It is also used in a modified form in some high-level Open University courses, where the amount of self-instructional materials produced to support student learning is limited.

The second approach is to 'tack' the distance-teaching system on to a conventional teaching system by video-recording lectures given to conventional student and preparing lecture notes to accompany the videos. The lecture notes can be reproduced (in modified form) lecture hand-outs, examples written up on block-board's, flip charts or overhead projector acetates, photographic slide, etc. Once lecture theatres have been equipped with video cameras and recording equipment, the additional per capita costs of preparing videos and lecture notes for use by off-campus students can be very little, as Wagner (1975) showed in respect of the off-campus graduate engineering programme at Colorado State University, and Lesile (1979) demonstrated in respect of the University of Waterloo Correspondence Program. A vast library of video material can be built up rapidly for relatively little total cost. While the quality of these videos may not be very high, they are adequate for their purpose. Broadcast by satellite, they can enable students spread over very wide geographical areas to 'listen into' lectures providing up-to-date information on technological advances. Students may also be able to participate in the lectures through telephone links (tutored video instructions, or TVI). Such approaches are now being used by a number of universities including the National Technological University in the United States.

Both the third and fourth approaches are based on the development of special self-instructional materials (print, audio-visual, broadcast etc.) designed to teach distance students. There is little doubt that the quality of specially designed and produce distance teaching materials can be very high indeed.

The third approach is to plan the curriculum and to specify course content in broad outline, and then appoint academic consultants to develop the written materials and script for broadcasts and audio-visual materials. This kind of approach was adopted by the Universidad Estatal a Distancia in Costa Rica. It has the great advantage that payment is by results. The academics are not permanent members of full-time staff, so there is no long-term commitment to train them, provide them with time to undertake research, deal with staff problems arising from low productivity or obsolescence of

knowledge relative to institutional needs, etc. Curriculum planners specify the aims, objectives and broad content of new programmes of study, and academic editors and educational technologies turn the consultants' drafts into finished products. If the authors fail to deliver the goods, they do not get paid. Advance notification of a course may be given, but sometimes (as at the Open Learning Institute in British Columbia), a course is only announced after all the materials have been handed over for production. The process has more in common with a publishing house than a university. Commercial correspondence colleges which create their own materials use consultants because this is obviously a relatively cheap and flexible way of employing academic course writers and broadcast and audio-visual producers. The cost of employing an author on contract can nevertheless vary, depending on 'supply'. In some countries or in some subject areas suitable authors can be hard to find and they may command high fees.

The fourth approach is to employ a core of full-time academic staff to create the course materials. Such staff may be appointed on permanent or temporary contracts. Where the appointments are permanent, the staff needs to keep themselves abreast with their subject areas, hence they need time off for study and possible research. After a time, permanent staff may acquire many of the skills of instructional designers and educational technologies. Unlike temporary staff, they are not always looking towards the next job, but bad appointments may become a long-term liability, particularly in systems where there is tenure.

The total salary bill also depends on how the academic staff is deployed. Institutions such as the Open University, Athabasca University in Canada, and Deakin University in Australia, which have adopted a course team approach (in which groups of academic and technical staff work together on a project team to develop a course) need higher levels of staffing than those that require the staff merely to stick to their own specialist task. On the other hand, while the course team approach is expensive in staff time and hence pushes costs up, it does enable staff to work in a very creative environment. Of these four approaches, the first is the cheapest and the last the most expensive.

A further factor to be taken into account in considering the cost of the course development, production and presentation system is the choice of media. Here again, management choice can greatly influence the cost of the system.

We have already noted Sparkes's contention that the time required to develop material designed to serve one hour of student learning varies significantly depending on the choice of media. The costs of developing their material are, however, not the only costs. Printed materials need to be designed, edited, typeset, printed and distributed; video and audio material has to be disseminated through appropriate channels and received on appropriate equipment; computer-based systems require extensive equipment and access to networks, as well as a great deal of investment in software.

To take the case of print, all material will require editing and design work. The cost of editing an author's manuscript into a form suitable for a self-instructional learning package is likely to be greater if contract authors are used. The cost of design can vary significantly, depending on the extent to which illustrations and artwork is incorporated into the text. The way the text is set affects costs. Offset lithography from typed originals is generally cheaper than letterpress printing from hot-metal type. Use of word processors instead of typewriters makes the preparation of camera-ready copy even easier, and can affect authoring costs. Timmers (1986) reckoned that the use of word processors at the Vancouver-based Open Learning Institute cut the time taken to develop and prepare for production a page of text from 120 hours to 50. On the other hand, where texts have to be handwritten, costs can escalate. The Allama Iqbal Open University pays its calligraphers on the same scale as university lectures. Some institutions, such as the Sri Lankan Open University, prepare their texts in more than one language, thus incurring the costs of translation. The costs of printing can also vary. Paper costs differ from country to country; different grades of paper may be used; and the costs of printing change depending on the method used. The costs of the offset litho process are affected by whether paper or metal plates are used. The former are cheaper but are good for only about 500 copies. The use of colour adds greatly to the costs of printing. Variations in distribution costs can be so significant that it is difficult to make generalizations, but obviously it depends on whether the materials are mailed direct to individual students, homes, as happens at the British Open University, or are dispatched to local centres for collection by students, as happens at the Universidad Estatal a Distancia in Costa Rica. Finally, printing costs are susceptible to economies of scale. The length of the print run makes a great deal of difference to the unit cost per title. On the other hand, where more than one year's stock is printed, the costs of storage will also need to be taken into account.

The production costs of video vary enormously too. The cost per hour of video-taped lectures is much less than broadcast-quality television. The latter is expensive for a number of reasons. The cost of

equipment to produce broadcast-quality television is greater than that required to produce video. Broadcasting unions in some countries have pushed the rates of pay to very high levels, and in many cases this has been coupled with agreements on staffing levels which have also exacerbated costs. What constitutes broadcast-quality television is also subject to different standards. In the United States the Public Broadcasting Service broadcasts three-quarter-inch Lo-band Umatic tape generated material, which is cheaper to produce than the three-quarter-inch High-band tape material used by the television companies in the United Kingdom. It is perfectly feasible to produce 'broadcastable' educational material at low cost. The National Technological University, for example, broadcast low-cost video-type lectures by satellite which is perfectly adequate for its purpose.

The distribution costs of video can also vary significantly, depending on whether video-cassettes or terrestrial or satellite-based systems are used (the latter encompassing both direct broadcasting by satellite (DBs) and satellite to cable head ends), and the extent to which the distance-education institution is responsible for meeting the capital costs of the distribution system or has access to transmission time at economic or marginal costs. In general television is an expensive medium and cannot be justified in circumstances where the basic infrastructure to support it (maintenance services and trained manpower) is lacking or a significant proportion of homes are not equipped with television sets (Eicher et al., 1982). The costs of home-based video systems, in which individual students are expected to equip themselves with video players and either record off-air or play cassettes which have been provided by the teaching institution on loan or for purchase can also be significant. The Open University found that it was cheaper to give each student a 60-minute video-cassette than transmit over the air provided that there were fewer than 133 students on the course. Between 234 and 233 students it was cheaper to loan a cassette to each student, paying the costs of postage each way. Over this level, it was cheaper to transmit once using the national television channels of the BBC. These cross-over points were obtained using cost-volume charts and, of course, be installed in local centres with students accessing cassettes from a library of tapes held at the centre. The overall costs of such a system will be lower but there are drawbacks, not least, the needs for the institution to maintain the equipment, ensure its safe-keeping, and provide sufficient players and quiet rooms so that students do not have to wait too long to view the cassette of their choice, and for students to travel to the centre at times when it is open.

Radio and audio-cassettes have the advantage that they are relatively cheap, and audio-cassettes can be used in imaginative ways with printed material to provide an audio-visual element. Eicher et al. (1982) were nevertheless skeptical about the cost-efficiency of radio in systems with under 2,000 students, while the Open University found that for courses with under 1,000 students, it was cheaper to provide audio-cassettes to each student rather than transmit radio programmes over the air.

The comments on the use of cassettes versus over-the-air transmission relate to costs and not to the educational effectiveness of the two modes of distribution. There is little doubt that distribution by cassette or systems where students record off-air onto cassette are educationally more effective since students can reply, as well as stop and start, the cassettes at will.

The costs of computer-based systems have been insufficiently studied to date, but the experience of the Open University, which has some 75,000 students taking degree-level courses, has been that the cost of providing each student with a personal computer is such that the institution itself cannot hope to fund the project. Even if the University restricted itself to providing computers to students taking courses where a significant level of computing is deemed to be academically essential, it would quickly have to provide for the needs of at least 13,000 students. A machine which meets the needs of the University (basically MS DOS operating system, 512 K memory and VT 100 communications capability) costs in the region of \$900-1,000 at 1981 prices, so the University cannot afford to equip students with personal computers. In view of this the University has recently instituted a policy under which it hopes that students will either buy the machines outright at a negotiated rate of discount, with or without a bank loan, or hire them from the University at a rate which still makes student purchase an attractive option for those students who can foresee the need to have a machine for several years.

The problem of student variable costs

Another factor which affects the costs of distance-education systems is the extent to which students are provided with access to support systems. The cheapest form of distance education is found in those systems which register students for an examination, provide them with details of the syllabus and a list of books which will help them, and leave them to prepare themselves. This approach is that used by the University of London external degree system. With the exception of those taking the

economics degree, students who wish to receive tuition have to enroll with a commercial correspondence college which provides them with lecture notes, set assignments, and arranges for these to be marked and commented on by a tutor. When students are ready, they present themselves for the examination. The cost of tuition is paid by the student. On the other hand, many of the new wave of distance-teaching universities founded in the 1970s and 1980s in the wake of the British Open University have developed a sophisticated system based not only on the provision of educational course materials but also of student support services including counseling, correspondence tuition and face-to-face tuition (Rumble and Harry, 1982). The cost of tuition and counseling is either a direct (variable) student cost or a semi-variable cost related to the number of students taken on by tutors and counsellors. Clearly, the provision of such services represents a reversion to the labour-intensive methods found in traditional education. The higher the direct variable or semi-variable cost per student, the nearer the teaching cost of distance education will approach that of traditional forms of education. Thus, for example, one of the Open University's early geography courses had a direct variable cost per student that was much higher than the variable cost of social science courses in traditional British universities, thus preventing the Open University from reaping any of the economies of scale said to be present in distance education, at least on this course (Laidlaw and Layard, 1974).

Obviously, as the amount of face-to-face tuition provided increases, so a basic characteristic of distance teaching, the physical separation between the teacher and the learner, is lost. Ultimately, the situation occurs in which conventional classroom-based teaching, whether provided by regular teachers or by semi-trained animators, is being supported by centrally produced materials. There are or have been numerous systems of this kind, particularly at primary and secondary level (for example, the Radio Mathematics Project in Nicaragua, the Mauritius College of the Air, the El Salvador Educational Television project, Telescondaria in Mexico, etc.). Schemes of this kind may have a lower cost per student because the additional cost per student of developing, producing and distributing the centrally produced materials is more than offset by reductions in cost arising from the use of semi-trained animators. However, they are not distance education systems.

The cost of the curriculum

A further factor which influences the cost of the curriculum the costs of distance education is the number of courses which the institution offers. Each course represents an investment in course materials. The more courses on offer, the greater the total investment and the greater the cost of maintaining them, or eventually replacing them with new versions or with entirely different courses.

The number of courses is determined to some extent by the number of subject areas to be covered, the extent to which students pursue a single subject in depth (for example a specialized single-subject degree course) or a combination of subjects, and the extent to which a range of optional courses is provided.

The most efficient distance-education system will be one with a relatively small range of courses and large numbers of students. The distance-teaching programme of the Universidad Pedagógica Nacional in Mexico is a good example. Dedicated to the in-service training of primary and secondary-school teachers, the range of courses offered by the University is relatively limited and the numbers of students (60,000 in 1980) substantial, thus ensuring that each course has a large number of students.

As more courses are added to the curriculum, so the number of students per course will decline provided the total number of students remains constant or does not increase proportionate to the increase in course options. For example, the British Open University was established in 1971. From the start it was assumed that it would grow quickly in size. In its first year it took in 25,000 students, registered on four courses. But by its second year, with course numbers increasing rapidly and student numbers still climbing, Laidlaw and Layard (1974) were already able to foresee that the case for developing higher-level courses with relatively small number of students would have to be justified 'on the grounds that they are an integral part of a system providing wider access to complete degree courses rather than that they are a cheap way of doing this'. By 1976 Wagner (1977) could point out that the economies of scale reaped by the Open University had been achieved in its first years of operation, since when it has been following the conventional university pattern of little increase in productivity. Wagner argues that the major reason why this was so that the University had been using the economies of scale produced by rising student numbers to increase the overall numbers of courses offered to students.

However, there were limits to the extent that the Open University could justify increases in its course offerings at the expense of economies of scale. Early in its development, the University prepared an

academic plan which aimed at presenting an undergraduate academic profile equivalent to 111 credits (each credit equivalent to about 420 to 450 hours of student work). It quickly became apparent that it could not develop and support this load within existing or likely resource levels, and accordingly a more modest plan for the presentation of 87 credits was approved. This plan, with minor modifications, still forms the basis for the Open University's first degree is a general degree, and that students will not be able to specialize in a particular subject area. Moreover, it is recognized that further expansion of the profile of courses will have to be accomplished through the development of inexpensive courses or be accompanied by an increase in student numbers.

One way of minimizing the costs of a profile is to extend the life of a course so that the costs of development can be written off over more years. Again the experience of the Open University is instructive. Originally it planned to replace its courses every four years. It rapidly became obvious that it could not both sustain this aim and increase the number of courses on offer to students. Courses now routinely have to last for from eight to ten years, with all the implications this has for credibility as course content becomes dated. It is only fair to say that the University is very conscious of this problem.

Commercial correspondence colleges have solved these problems by only presenting courses with comparatively low development and production costs, concentration on courses that will not rapidly become outdated, and resolutely not developing courses which will attract relatively few students over their life. The new video-tape lecture systems such as that developed by National Technological University in the United States has solve the problem of presenting state-of-the-art material which dates rapidly by video-taping lectures given in conventional universities, but the videos fall far short of the standards of self-instructional teaching material adopted by the best distance education systems.

Absolute costs, average costs, efficiency and effectiveness

The many examples given above show not only how difficult it is to cost distance education in the abstract, but also how the costs of particular systems can be affected by management decisions. For this reason, relatively few costs have been cited in this article.

The absolute cost of a system can be very high. On the other hand, the cost per student can be brought down below that found in traditional systems operating at the same educational level. Whether this happens may well depend upon the number of students attracted into the system. The chances of the Venezuelan Universidad Nacional Abierta reducing its average costs to a level where it could achieve its planners aim that it should bring down the annual cost per student and reduce the social cost per graduate was threatened by the disastrously high drop-out rates it experienced in its early years (only 22.6 per cent of the 1978 intake passed the introductory course), and the fact that the number of students attracted into the University actually fell between 1978 and 1981 while course offerings increased (Siqueira and Lynch, 1986). With an annual enrolment of about 4,400, the costs per course enrolment at Athabasca University were comparable with those found in conventional Albertan universities, while in 1972 the average cost per student at the more capital-intensive British Open University was found to equal that in conventional British universities when the university had 21,700 students (Laidlaw and Layard, 1974). (At the time of this study, it already had over 31,000 students).

Most economic studies measure the relative cost-efficiency of distance and traditional educational systems. Efficiency is considered with the cost of achieving outputs: an organisation is efficient relative to another enterprise if its outputs cost less per unit than that of the other institution. It becomes more efficient to the extent that it maintains outputs with a less than proportionate increase in inputs. The fact that a distance education institution has a low cost per student, credit hour or graduate does not necessarily mean that the institution is an efficient as it could be. It may well be able to reduce its unit costs by increasing its internal efficiency through changes in practice and costs reductions, as Mace (1978) commented in respect of the British Open University.

Generally, in making a comparison, it is assumed that the quality of the output of systems operating at the same educational level is comparable. This is not always the case. There is, however, some concrete evidence that the level of comprehension of students completing traditionally taught economics courses Heriot Watt University in the United Kingdom and those completing distance-taught economics courses at the Open University was similar (Lumsden and Scott, 1982). More generally, however, 'planners will be disappointed at the amount of evidence available' (Eicher et al., 1982), since what there is suggests that motivated students can learn from any medium provided it is competently used and adapted to their needs (Eicher et al., 1982; Wells, 1976).

Who should pay?

The costs of any distance-education project may be met by a number of agencies. Broadly speaking, the possibilities are government, international aid agencies, employers and students.

In considering who should meet the costs, a distinction is sometimes made between projects that aim to reach students in the normal school-age population and those aimed at post-secondary or adult populations. It is often argued that the costs of adult education should not fall on government. The reasons for this include: (a) adherence to a 'front-loaded' model of education which undervalues adult education, and hence believes that it is not something that should be paid for by government; (b) the belief that non-vocational adult education is essentially a private affair, of benefit to the individual, and that therefore the individual should pay for it; (c) the belief that the costs of vocational and professional education should be met either by the individual or his or her employer; and (d) concern at the open ended nature of the commitment to 'continuous education' that is implicit in the extension of state to adult education.

There is, however, another perspective that argues that the education of adults is not a luxury, that increased technological and social change leading to the obsolescence of knowledge acquired during the initial period of education and training requires continuing investment in the retraining and re-education of individuals, and that this is not just something which the individual or employer should pay for (since the capacity of individuals and employers to pay for it is limited), but also a responsibility of government.

Many governments are aware of the need to retain large number of people in areas of national skill shortages, but they have been much more reluctant to acknowledge a responsibility for the development of adult and continuing education in non-vocational subjects and areas where there are no skill shortages. The question 'who pays?' is thus linked to the question 'What is being taught?'

It is clear that large employers are seriously concerned about skills shortages and the need for retraining. Several large companies have set up in-house distance-and open-education programmes to meet the needs of dispersed work-forces. The State University of California, Caico, has set up a satellite-delivered video-tape and tutored video instruction system to meet the needs of engineers working for Hewlett-Packard. Small firms, however, cannot afford to invest in the development of distance-teaching systems.

Individuals, while they may be willing to invest some personal resources in their further education, have to do so within the level of discretionary income which they have available (that is, the income they have left over after they have paid for the basic necessities of life for themselves and their families). What constitutes discretionary income will be determined by income levels, personal expectations about what is a necessity, and the cost of these. It is clearly important that those setting up a distance-education system should know what the discretionary income of the target student population in order that judgments can be made about students' potential ability to pay fees and meet the costs of studying.

In a commercial correspondence college, the fee per student per course (Y) will need to cover: (a) the direct (student variable) cost of teaching (Ω); (b) the direct costs of presenting the courses ($P\pi$); (c) the development and production costs of the courses ($C\delta$), annualized over the life of the courses (L), and uplifted by projected rates of inflation in order to generate the capital required for investment in the replacement course; and (d) the fixed costs of the enterprise, including as allowance for the replacement of capital (F). The more student courses (s') there are in the system, the lower the fee can be:

$$Y = \Omega + \frac{P\pi + (C\delta/L) + F}{s'}$$

A commercial correspondence college may also wish to generate a profit.

The institution will need grants from government or other sources to the extent that student fees do not meet total costs. Not surprisingly, commercial correspondence colleges have restricted themselves to course lines which do not need constant updating and which will attract high volumes of students. There is always the danger that the number of students attracted to the programme will be insufficient

to generate sufficient funds to replace the stock of courses and the other capital tied up in the British Open Tech project: when the government's pump-priming funds came to an end, the projects had to become self-sufficient. Relatively few of them had enough students to be able to make this change.

One other aspect of costs needs to be mentioned here, and this is the cost to students of equipping themselves to study. Depending on the media choice made by the institution, students need to have access to a range of equipment in order to study. In some cases personal ownership of the equipment is already widespread among the population at large and it may be reasonable to expect all students to supply their own equipment (radios). In other cases (television sets, audio-cassette players, video-cassette players, personal computers), student ownership will depend in part on the market penetration of the equipment among households, given the society in question, or the extent to which it is reasonable to expect students to equip themselves out of their discretionary income. Among other factors which may come into play is the extent to which the piece of equipment is required on a number of courses, or will only be used on one or two courses. In the latter case, or where it is clear that students will be unable to afford the equipment themselves, then the institution may have to provide it for students. It is very important that in deciding what media to use, the cost to the student of the particular choice is evaluated against the students' ability to meet it.

It is clear that the introduction of new technologies can change the cost structure of distance education and also the balance between the extent to which the institution or the student is expected to meet the cost. Distance education is seen as a means of lowering the cost per student and hence of reaching more students. It will be particularly ironic if, through the adoption of new information technologies based on the computer and advanced telecommunications, students should have to bear an increased proportion of the costs of learning, for, as the cost to the student rises, so it becomes more likely that only the better off will be able to afford access to distance courses without government and employers' help. If help is not forthcoming, then 'advanced technology' distance education will become yet another service restricted only to those whose discretionary income is large enough to meet the cost. The disadvantaged, the unemployed and the low paid will lose out, though low-cost, traditional correspondence-based systems (based on print and correspondence tuition with some use of audio) may continue to serve their needs. In Third World countries, this latter form of distance education may be the only kind that can be provided, given, the costs involved in setting up and running the more expensive 'high tech' forms of distance education.

This article has shown why, given the differences, in the structure of costs between distance and traditional education systems, the former can be cheaper per student, credit hour of graduate than the latter. Distance education can be as good as traditional forms of education, in terms of the quality of what is learnt. Whether distance education is actually cheaper depends on a number of factors, including choice of media, the number of subject areas cost is kept below the level found in traditional forms of education, and, of course, the number of students. It has also shown the issue of who pays (student, employer, or government) is an important one which has a bearing on both what is taught and access, and it has suggested that, as new technologies develop, so the technologization of distance education will put increasing costs on to students, with further implications for access. Third World countries, it is suggested, may be unable to exploit the new 'high tech' forms of distance education now being developed in the advanced industrialized countries.

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UNIT 2:

THE DISTANCE EDUCATION CHAMELEON: NEW TECHNOLOGIES AND THE CHANGING COST-STRUCTURE OF ODL

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[Paper presented at the 20th AAOU Annual Conference on “*Reflections on and future prospects for choice and use of new technologies in ODL – Strategies, cost-effectiveness and impacts*” in Kunming, Yunnan, China, 11-14th October, 2006) (Reprinted by permission).]

The paper starts by going back to the classical definition of distance education and its theoretically most influential conceptualization as ‘*most industrialized form of teaching and learning*’ by Otto Peters. The most salient realizations of this form of distance education have been open universities using print and broadcast technologies.

The cost-effectiveness of distance education was based on the *media-equivalence hypothesis* (with respect to outcomes) and the potential for *scale economies* (with respect to costs). In fact, accepting the media-equivalence hypothesis allowed distance educators to largely collapse *cost-effectiveness analysis* (CEA) to cost-analysis. Cost-analysis allows to capture the *cost-structure* of distance teaching (i.e. the relative weight of fixed and variable cost per student in the total cost equation) and to mathematically model the cost impact under various circumstances.

The weak point of traditional ODL was certainly the responsiveness of the communication between teacher and students (teacher-student interaction). The new digital and Internet-based technologies (referred to later as ‘new technologies’) allow now to realize two different types of *learning scenarios*: one which is more akin to traditional on-campus teaching (e.g. remote classroom; virtual seminar) and one which exploits the digital capabilities to enhance learner-content interactivity (e.g. simulations). In both cases the impact of the new technologies on the cost-structure is different. *Synchronous technologies or asynchronous virtual seminars* put more emphasis on teacher-student interaction, thus re-establishing a lock-step relation between increasing costs and number of learners (a linkage distance education has prided itself to have broken).

On the other hand new technologies also allow to making use of *resource-based teaching approaches*, a line of development which is in principle in line with the traditional cost-structure of ODL though probably increasing the up-front costs of development, which means that, in order to bring *average costs* down to standard level, even larger enrollment numbers are required.

However, given that for most educators *quality* of education is strongly linked to student-teacher interaction the responsive forms of distance teaching will gain momentum. This poses the threat that the costs of distance learning will raise and that the new forms of distance education will price themselves out of the traditional market distance education of students from the lower income brackets.

How can distance education re-capture some of the lost efficiencies (lost because of the impact of new technologies on the cost-structure of traditional distance education) given that the demand for responsiveness of teacher-learner interaction is here to stay?

Two main options are considered: *cooperation* and the use of *learning objects*. While ODL has been seen as a system, it is clear that not all components of the system need to be hosted at the same organization. This can create synergies by reducing either development or teaching costs or open new markets.

Learning object management is trying to use developed material not only along the lifetime of a course but also across different courses. This allows distributing fixed costs of development not only over the students of a specific course but also over students in different courses.

Distance education: What is it?

It is probably boring coming back to definitions. The *minimalist* definition of distance education is 'education at a distance', i.e. education where 'teacher'¹ and student are separated for most of the time. It is likely that in his seminal research (Peters, 1967) Otto Peters started with this (almost tautological) definition only to come up with a conceptualization of distance education as most 'industrialized form of teaching and learning'. Peters found that in spite of very diverse contexts the very feature of geographical separation produced quite comparable organizational and technological responses. That was in the sixties and the early seventies. Note that at the time *technologies for responsive interaction were not available*². At the time even radio and television as educational media were just in the offing. Hence it comes to no surprise that the focus of Peters' analysis was on the organizational level rather than the level of technology. Peters observed that most distance education institutions based their teaching on pre-produced material and built a feed-back structure via correspondence and occasional face-to-face meetings in learner centers or during summer schools. The division of labor included a number of technical functions but also *unbundled the teaching function* in the sense of teaching as (i) course development (writing/producing the course materials) and (ii) academic tutoring.

Peters saw himself as a 'daredevil' identifying a new type of education, which was very different from the *Socratic model of teaching*, which pedagogic mainstream saw as the heart of good teaching³. How could distance education be seen as at eye level with traditional education, if it is deficient with respect to the very core requirement of educational transaction: teacher-student interaction? Peters' colleague Boerje Holmberg solved this question. He suggested that it was possible to design interaction into the teaching material. This he called 'simulated interaction' (Holmberg, 1989). Material designed in this manner typically includes *in-text questions* and *in-text activities*⁴. Students should not fall into a mainly receptive reading mode but enticed to interrogate the text by all sorts of devices.

The important point in this context is that 'simulated interaction' can be handled in an industrial manner. It can be developed by a team of developers (combining subject matter experts, instructional designers, media specialists) and replicated mechanically and at large scale. High quality industrially produced course content then could be complemented by an arrangement for two-way interaction, at the day mainly meaning correspondence (marking and providing extensive feedback to assignments) or face-to-face summer school⁵.

If one translates this into institutional systems one would describe distance education as a system (Figure 1) composed of a number of subsystems, including, besides administration and management, *course development* and *learner support* as major subsystems.

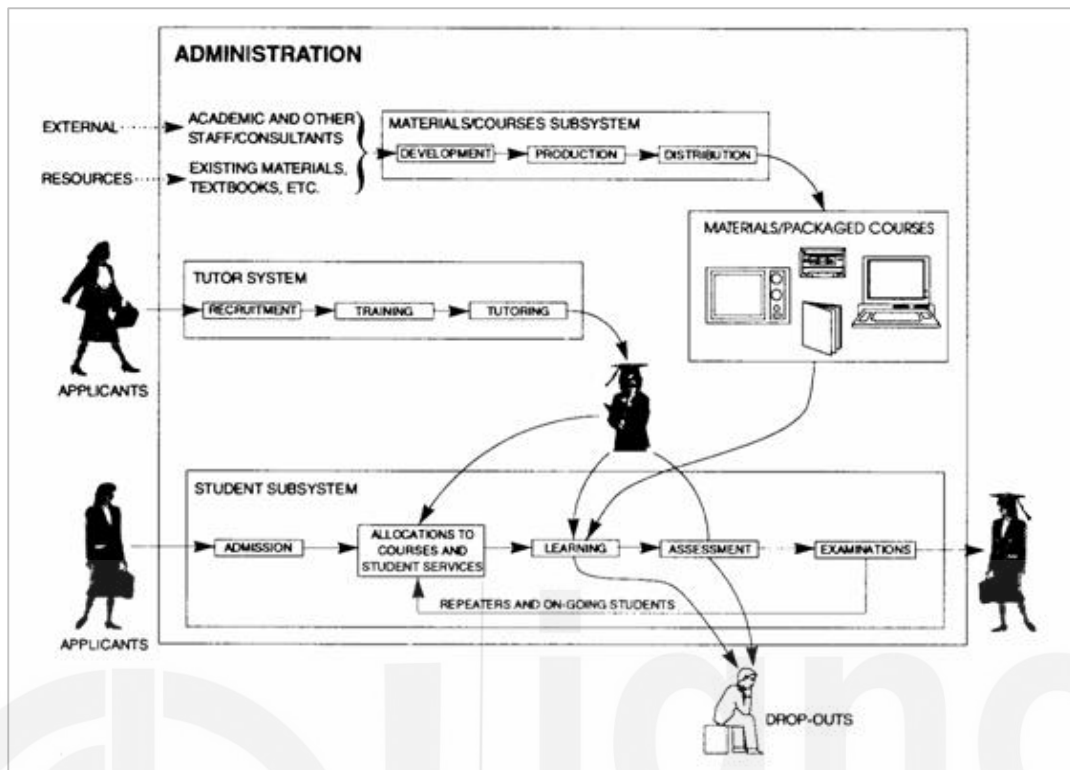
¹ We put the teacher in quotation marks to signal that distance education had an impact on the role of the teacher. (We come back to that later.)

² What constitutes 'responsive interaction' may remain somewhat vague. The telephone facilitates responsive communication; correspondence does not. However, responsive communication has not to be synchronous; asynchronous text-based communication is classified here as responsive. Possibly a working definition could be that in responsive communication it is possible to exchange messages within hours or, at most, a day.

³ "At that time you had to be bold, if not to say dare-devil to offer such a comparison between a process belonging to the lofty sphere of ideas and a process belonging to the ugly world of soot-blackened factories with smoking chimneys." (Peters in Bernath & Rubin, 1999, S. 143) While Peters is right that his formula was not popular with mainstream educators, it was very much in line with other main development currents of the time such as the development of economics of education and especially 'human capital theory'.

⁴ For an illustration cf. The COL produced PREST materials (COL, 2004)

⁵ Note that in this sense distance education always has been 'blended learning'.



Source: Based on Rumble (1997)

Figure 1: Distance education as a system

It is important to note that this unbundling of the teaching function places the academic prestige largely in course development whereas the tutors are not allowed to teach in their own right. Concluding from Mills (2003) we can conclude that academic teaching is largely identified with course development whereas learner support is considered as being outside the realm of academic teaching⁶. This classification is slightly counter-intuitive given the widespread Socratic ideal of teaching as a dialogue. But it is a logical concept for distance education. In this context, this difference in prestige (between academic teaching = course development and student support) is of considerable importance since it has consequences for the cost-structure of traditional distance education.

To sum up: the difference that distance education had to teach beyond geographical distances implied reorganizations in terms of teaching and learning. Given the lack of technologies (at the time) which would allow responsive interaction at a distance in these foundational years of distance education, it was necessary to shift the focus of instruction from *real* to *simulated* interaction. The production of course material including 'simulated interaction' can be realized industrially allowing spreading the high development costs over large student numbers. This allows reducing average costs through scale economies.

The second means to achieve cost-efficiencies was related to the re-interpretation of prestigious academic teaching as course development while the front-end activities of tutor-student dialog could be left to less qualified tutors working under quite different employment conditions as the tenured academic staff occupied essentially with course development.

⁶ Mills argues: "For the purpose of the argument here, the widest definition of learner support will be used. This is the totality of the provision by an institution to support the learner, other than generic teaching materials produced by instructional designers/course producers. To be absolutely clear, *where learning materials are produced for numbers of student this is regarded as the academic teaching and is considered to be outside the framework of learner support.*" (Mills, 2003, p. 104; my emphasis)

Costs and economics of traditional distance education

Peters himself never translated his concept of distance education as most industrialized form of teaching and learning into economic terms. But when education can be processed by industrial methods it is obviously also open to economic analysis. Two sets of studies were seminal in developing the corresponding methodology. One refers to the (then recently founded) British Open University (incl. Wagner (1972, 1977), Laidlaw & Layard (1974); Lumdsen & Ritchie (1975); Rumble (1976); and Mace (1978)). This set of case studies provided the template for institutional comparisons; most prominently between so called *dedicated* or *single mode distance teaching institutions* and conventional campus-based (i.e. face-to-face) teaching. Later, institutional comparisons were extended to *dual-mode institutions* and *consortia*. Reference points for these institutional comparisons were 'cost per students' and 'cost per graduates'.

The second set of seminal case studies analyzed a number of major instructional technology project funded by the World Bank (incl. Jamison, Suppes & Wells (1974); Wells (1976); Klees & Wells (1977); UNESCO (1977, 1980, 1982); Perraton (1982)). The main research question of these studies was aiming at determining the most cost-efficient⁷ medium of instruction, such as educational broadcasting (radio or television) or print as compared to traditional classroom (face-to-face) teaching. The reference points for these comparisons were mainly 'cost per student learning hour' (cost/SLH). The outcome of these two sets of case studies was a widely accepted methodology in analyzing the cost-efficiency of distance education.

The core concepts were the two (independent) binary distinctions: *fixed costs* and *variable costs* on the one side, and *capital* and *recurrent* costs on the other side (Table 1).

Table 1: Two distinctions

Costs	capital	recurrent*
fixed	fixed and capital, e.g. buying a new server	fixed and recurrent, e.g. manager's salary
variable	variable and capital, e.g. science kits	variable and recurrent, e.g. production and mailing of course material

* Other authors (e.g. Rumble, 1997) differentiate between capital and operating costs. Operating costs then are subdivided as recurrent and non-recurrent operating costs.

The first comparison was between the British Open University (UKOU) and conventional face-to-face universities (in Britain). Conceptually the costs of the Open University were seen as falling into two main categories: central university costs and costs of courses (both fixed and variable). Direct course related costs comprise fixed costs of development and variable costs of course implementation. While course development in campus-based universities is comparatively low-cost, the Open University invested heavily in course development⁸. Full time tenured faculty and staff developed the courses. Course implementation on the other hand was for the OU comparatively cheap since it used lower paid adjunct faculty for tutoring purposes. It was mentioned above that teaching in the OU was largely identified with course development while tutoring was seen as being out of the realm of academic teaching and (only) part of student support. This had financial implications, on which the cost-efficiency argument rests.

Figure 2 compares the costs of the OU with the costs of an average conventional British university. The upper diagram shows the total costs. The (steep) red line representing the quickly rising costs in the conventional system: costs are driven by volume; there is a linkage between numbers of students taught and rapidly increasing costs. The (less inclined) blue line represents the OU case where costs

⁷ The distinction between cost-effectiveness and cost-efficiency (as it is used here) varies with respect to output/outcome measures. If output is easy to measure (such as number of students, number of graduates) we tend to use the word cost-efficiency as referring to the cost/output ratio. If outcome evaluation includes educational goal attainment measures (such as test scores) we tend to use cost-effectiveness. The distinction is sometimes blurred since cost per graduate is easy to count but involves educational assessment procedures internal to the institution.

⁸ Hülsmann (2000) reports development costs over a million dollar for a course of the OU's School of Health and Social Welfare (Case study 1).

raise slower. This means that the linkage between volume of activities (number of students taught) and costs is, while not broken, but significantly loosened.

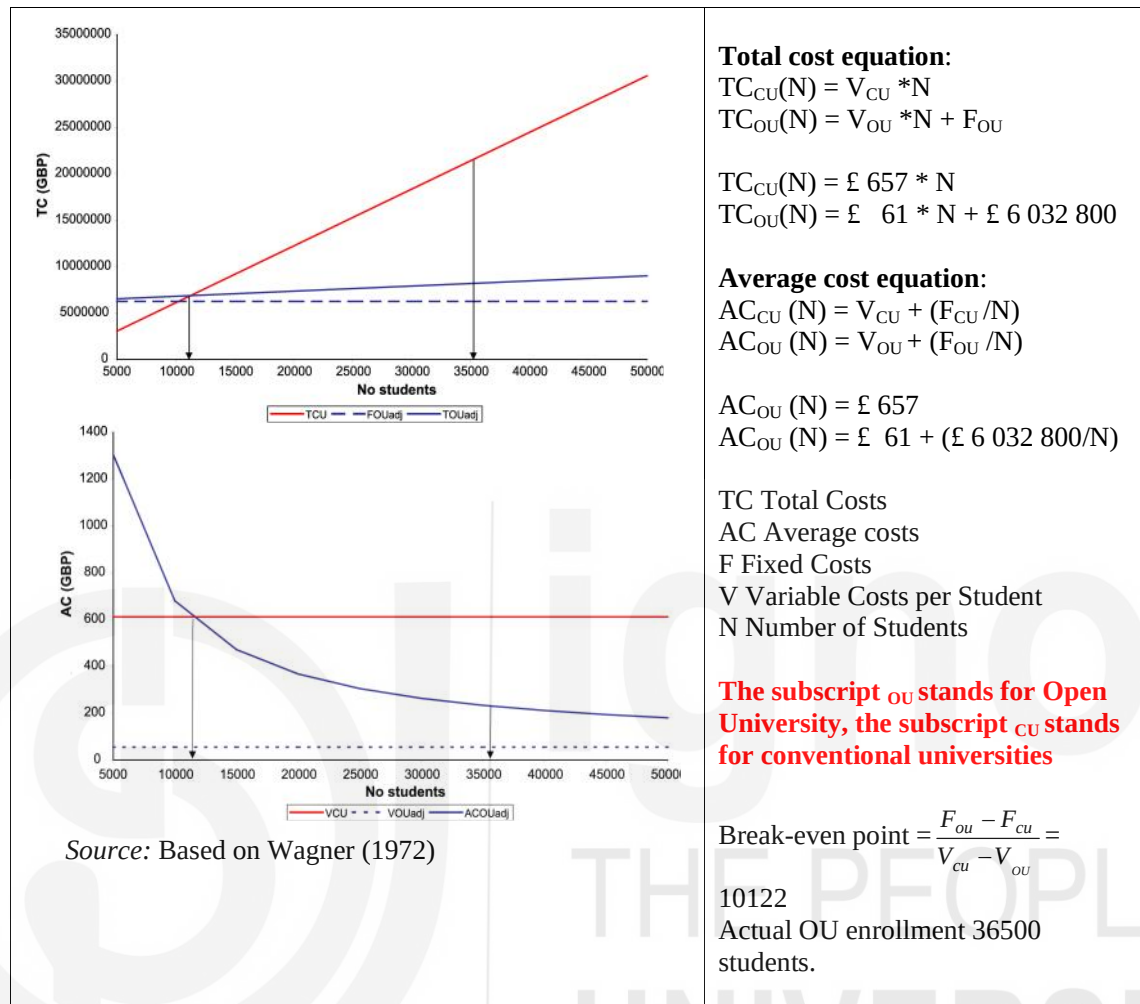


Figure 2: Cost-efficiency of distance education: The UKOU

The lower diagram in Figure 2 depicts average costs. The conventional system cannot reap visible scale economies. Average (direct teaching) costs remain constant (red line parallel to x-axis) since the fixed costs of the system cannot be over many users. This is different for the UKOU system. Average costs drop dramatically with increasing enrollments.

While things are in practice slightly more complicated since, in order not to compare apples and oranges, a number of adjustments have to be made such as: (i) adjustments to account for difference in research output; (ii) adjustments for types of students including adjusting for the difference between part-time and full-time students; (iii) a final adjustment was necessary to make cost figures comparable (since cost data were taken at different dates).

The findings suggested that the OU was significantly more cost-efficient than the conventional system. The method developed in these case studies became the conceptual template for comparing dedicated distance education with conventional universities. Point of comparison is generally *cost per student* and *cost per graduate*. While it was generally found that in terms of cost per student the distance teaching institutions compared favorably, the evidence for the cost per graduate comparison was more mixed.

As a major outcome of this type of research it is possible to identify main cost drivers in distance education still relevant today:

- *Fixed costs of course development:* According to the logic of shifting the burden of teaching from real towards simulated interaction, care was taken to develop high quality material often at high costs. However, at the same time there were warnings not to go for all the 'bells and whistles'. You need to balance costs of course development with the prospective numbers of students likely to enroll in the course (this is obviously also dependent on the shelf life of the course).
- *Variable costs per student:* The production costs of the unit of course material and the real teacher student interaction contribute to the variable cost per student. It is important to keep these costs down since no amount of scale economies can bring average costs below the variable cost per student. These costs determine the asymptotic line towards which average costs can fall but it never can fall below this line.
- *Number of courses:* If the number of courses is increased without at the same time substantially increasing enrollments the added number of courses erodes the cost-efficiency (measured as average cost per student). On the other hand: it is necessary for a program in order to be attractive to offer a reasonable scope of choices⁹.
- *Number of students:* To the extent the cost-efficiency design is based on scale economies large numbers of enrollments are necessary to spread fixed development costs¹⁰. Numbers depend both on enrollment per class and shelf life of the course. To which extent the enrollment level can be set (e.g. as a result of marketing efforts) is a moot point.
- *Institutional overheads:* Include both fixed and variable costs. Part of the variable costs per students is administrative or help-desk costs. As with respect to direct variable cost per student indirect cost per students need to be kept low if the institution wants to assure its cost-efficiency edge. It is important to realize that scale economies not only can be achieved with respect to direct course costs but also with respect to central university costs.

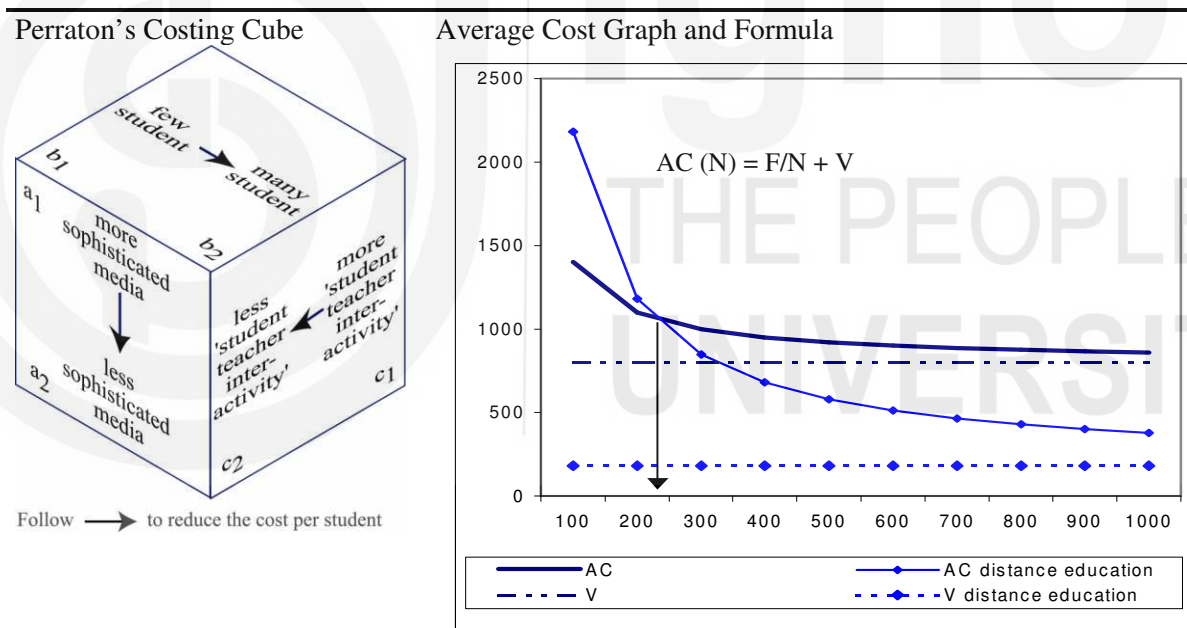


Figure 3: The cube and the formula

The Perraton Costing Cube (in Figure 3, left) depicts some of these cost drivers and can nicely be related to the Average Cost Graph (in Figure 3, right). Sophisticated media are associated with high course development costs (i.e. high fixed costs of development F); student numbers (N) allow to spread these fixed costs over many learners (i.e. F/N), and student teacher-interactivity contributes to variable cost per student (V).

⁹ The danger to erode cost-efficiency by offering too many courses is often referred to as 'diseconomies of scope'.

¹⁰ Note the difference between scalability and scale economies. A program can be scalable if resources are available and prices can be set to recover the cost of resources. Scale economies refer to the falling of average cost per student due to the difference between fixed and variable costs.

Perraton's efficiency path, however, stands under a *caveat*: the planner can decide about the media sophistication level, he/she can decide about the amount of student support, but he/she cannot determine the amount of students¹¹. It may well be that 'following Perraton's efficiency path' means reducing the attractiveness of the course to the extent that enrollment level falls. This could result in a situation that average costs turn out to be higher than in case of more substantial investment in either course development or student support.

While the institutional comparisons between dedicated distance education institutions and conventional universities led the basis for widespread convictions that good distance education can be more cost-efficient, it has been pointed out that a number of parameters have changed (cf. Rumble, 2004):

- (i) conventional universities have also changed and increased internal efficiencies; in Britain they were forced to increase their throughput without proportionally increased funding;
- (ii) other institutional models led to a more complicated landscape; there are *dual mode* and *mixed mode* universities and *consortia* whose appearance contributed to fragment the market making it more difficult for (dedicated) open universities to achieve the required scale ('pirhana effect'); the near ubiquity of courses offered at a distance from within all sorts of conventional education makes the situation even worse;
- (iii) within the institutional models different working practices can impinge on cost drivers; this includes modes of course development as well as outsourcing practices.

Nevertheless, fundamentally the analysis of traditional distance education provides a solid rationale for expecting cost-efficiency in distance education: as long as the focus of teaching is shifted away from real interaction to simulated interaction, and because of the possibility to objectify/commodify simulated interaction, it can be expected that distance education has significant advantages in terms of cost-efficiency.

The second set of seminal case studies analyzed major instructional technology projects funded by the World Bank (in the seventies and eighties) (Table 2). The focus here was not institutional comparisons but comparisons between different instructional media or technologies¹².

Table 2: *Cost of Instructional Television (ITV) and Instructional Radio (IR)*

PROJECT	YEAR	N	H	F	V	AC	AC/V	AC/H
Instructional Radio (IR)								
<i>Thailand</i>	1967	800 000	25	US \$ 100 400	US \$ 0.221	US \$ 0.35	1.57	0.014
<i>Mexico</i>	1973	2 800	233	US \$ 37 700	US \$ 0.11	US \$ 13.57	123.40	0.058
<i>Indonesia</i>	1971	1200 000	100	US \$ 1 202 400	US \$ 0.32	US \$ 1.32	4.13	0.013
Instructional Television (ITV)								
<i>Colombia</i>	1965	27 000	50,25	US \$ 624 000	US \$ 0.859	US \$ 3.13	3.64	0.062
<i>American Samoa</i>	1972	8 100	145	US \$ 1 268 000	US \$ 1.859	US \$ 158.40	85.21	1.092

¹¹ Though marketing can to some extent influence N.

¹² In the following the terms *media* and *technologies* are used largely interchangeably. The possible difference, however, can be easily illustrated: text is a medium, which can be displayed by different technologies, e.g. as print or as digital text on a computer screen. Similar observations apply to audio media, which can also be realized by different technologies such as a DVD or audio tape. From an educational point of view the technology is important to the extent it enables and constrains the symbols systems and the symbol processing capabilities of a medium (cf. Kozma, 1991).

<i>Mexico</i>	1972	29 000	360	US \$ 598 000	US \$ 2.859	US \$ 23.48	8.21	0.065
<i>Ivory Coast</i>	1970	745 000	180	US \$ 2 454 000	US \$ 3.859	US \$ 7.15	1.85	0.040

Source: Based on Tables IV and V in Jamison & Klees (1975, pp. 356-7). N denotes the number of listeners/viewers; h the number of IR/ITV hours produced, F, V, AC, as usual denote *fixed costs*, *variable cost per student* and *average cost per student* respectively. The quotient AC/V denotes the level, to which the potential for scale economies is exhausted. AC/h (written as 'Student -Hr.Cost') denotes the *average cost per student per hour of radio or television*, and is calculated by dividing the total input costs by N*h, i.e. $TC/(N*h) = (TC/N)*(1/h) = AC/h$. -The figures reported in the table are in US \$ '72 and fixed capital costs are annualized at $r = 7.5\%$.

How is it possible to compare the cost-efficiency of a medium? There are essentially two methods: (i) one may compare teaching the same content with various media; if it is reasonable to assume that the outcome of both methods is comparable you can compare the respective costs; this approach is referred to as cost-effectiveness analysis (CEA); or (ii) you can try to stay away from comparing the educational outcomes (the respective effectiveness) and content yourself with comparing 'cost per learning hour' only.

Within this context the theory of 'media equivalence' has a strategic function¹³. Planners who do not want to get bogged down into the minefield of attribution issues (such as: which extent better scores in learning can be attributed to a medium) strongly endorse the media equivalence hypothesis. While it is easy to disprove a strong formulation of media equivalence by counterexamples, empirical evidence seems to demonstrate that the choice of the medium by itself has little effect on teaching outcomes (e.g. Russell, 1997). Beyond often shallow empirical research it may be worth noting that all media (eligible for teaching) can represent (theoretical) language, be it as text or speech. It may well be that it is this basic overlap of all teaching media in terms of their symbol processing capabilities (rooted in language), which explains what there is in terms of evidence for the media equivalence hypothesis.

If we accept that any attempt to rank media according to their effectiveness is a blind alley, any context independent ranking of their cost-effectiveness also seems not to be viable. Where cost-effectiveness comparisons are reported, it generally turns out that equivalent outcome has been assumed.

Where media comparison tried to stay away from the minefield of evaluating media effectiveness, the focus was on costs. However, even then a point of common reference would be needed to compare costs ('costs of what?'). If you want to compare the costs of books and radio, you can do little without knowing the number of pages or the length of time of the radio emissions. Two approaches have been used, both making use of the concept of cost per student learning hour. One, calculates the average cost per student learning hour per student (the AC/h in Table 2) (e.g. Jamison & Klees, 1975; this approach is also followed by Bates, 1995). The problem with calculating 'cost per student learning hour per student' as a point of comparison is the high context sensitivity of this measure. This is why Hülsmann (2000) suggests calculating separately the 'development cost per student learning hour' characteristic for a specific medium and the associated variable costs. Both parameters together allow modeling the cost implications of the preferred media choices during the development process.

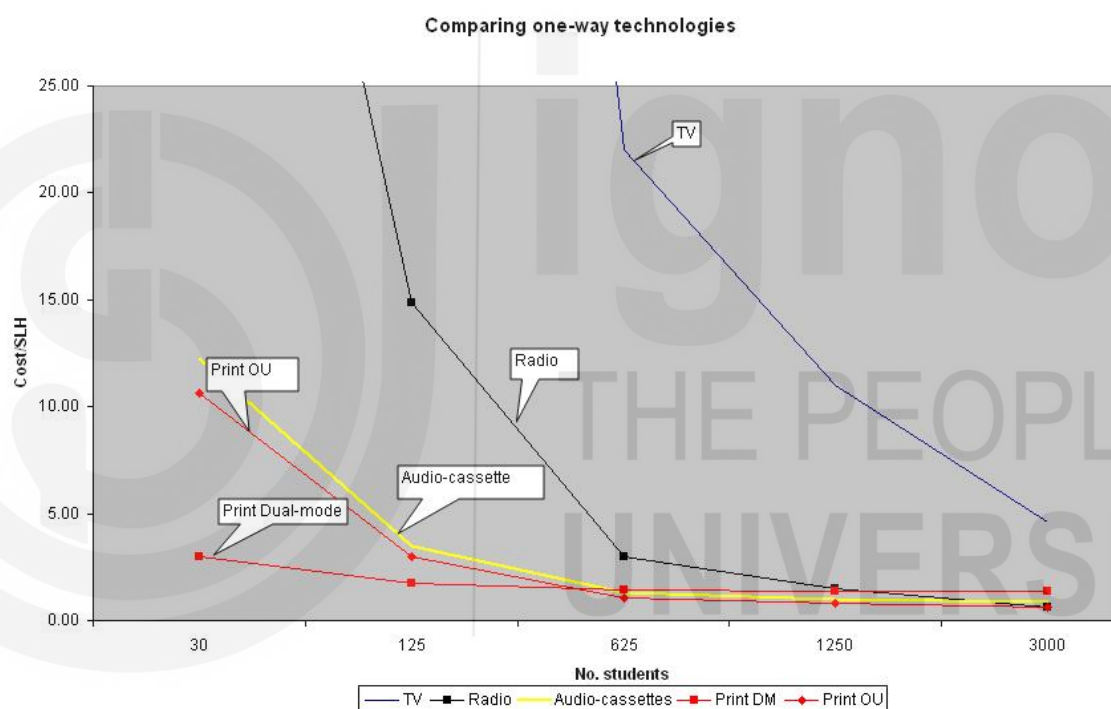
¹³ The theory is supported in stronger and weaker versions. A strong version is held by Clark who claims that "media does not influence learning under any conditions. ...The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes of nutrition." (Clark, 1983, pp. 445) Similarly Perraton: "We can state the theory of media equivalence boldly: communication media do not differ in their educational effectiveness." (Perraton, 1987, p.4) A weaker version is offered by Moore & Kearsley: "Provided the medium is well-chosen and functioning effectively, it plays a minor role in affecting learning outcomes." (1996, p.65) The most realistic summary of the discussion is possibly due to Kerres: "The quality of a medium in terms of teaching and learning cannot be inferred from its own intrinsic characteristics (...) but only judged within the context of its use. Hence it is this context, which determines the quality, rather than the medium ... The effectiveness of learning of mediated teaching and learning in a concrete situation has to be determined ex post by research and findings about its effectiveness cannot without further considerations transferred to another situation or context" (Kerres, 2004, p.8) While Kerres not rules out that media can contribute to learning effectiveness he advises against seeing it as a quality of the medium as such. This discourages any attempt to rank media according to their effectiveness, and, by consequence, according to their cost-effectiveness.

Table 3: Cost per SLH

Medium	Cost per student learning hour in 1998 US\$	Ratio to print costs
Print	825	1
Radio	24 750 to 44 550	x 50
Television	148 500 to 206,250	x 150 to x 180
Audio	280 050	x 36
Video	29 700 to 138 600	x 36 to x 170
CD-ROM	33 000	x 40

Source: Based on Perraton & Moses (2004, p. 149) und Hülsmann (2000, pp. 17-19).

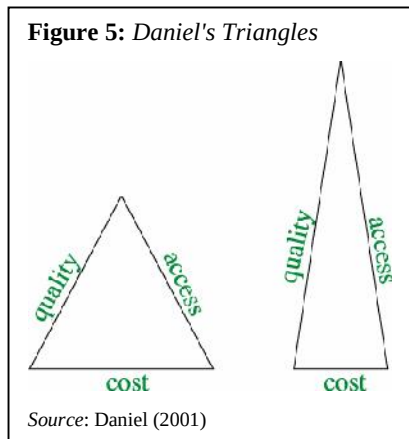
While Table 3 and the Figure 4 may not be able to claim accuracy, both, table and diagram, suggests that media differ in *order of magnitude* when it comes to their respective potential for scale economies. Television is seen in both cases as related to the highest fixed costs of development followed by radio. Figure 4 also depicts that while radio has higher fixed costs of development as compared to audio cassettes, the almost absent variable cost per student in case of radio means that radio can achieve comparable cost-efficiency if scale economies can be exploited.



Source: Based on Bates (2005)

Figure 4: Cost of one-way technologies

The findings show that media (like institutional modes) have specific cost-structures, i.e. a characteristic composition of fixed versus variable costs, and therefore a specific potential for scale economies. In both cases, i.e. with respect to the institutional comparisons (dedicated distance teaching vs. face-to-face teaching), or with respect to the comparisons of instructional media, *the rationale for expecting cost-efficiencies is the potential for scale economies*. Distance education institutions, by their very definition (i.e. their need to bridge the geographical gap to the learner) have to rely on media. The earlier generations of distance education was predicated on the use of mass media (or resource media; Hülsmann, 2000). Their analysis demonstrated a cost structure which is (albeit to different extent) capable of scale economies. The institutional format (with a special subsystem for course development and production) is complemented by the cost-structure of the media themselves in a virtuous circle of facilitating cost-efficiency.



The consequent expectation that distance education is cost-efficient is nicely captured in the Daniel's Triangles (Figure 5). According to Daniel distance education is able to solve the tension between quality access on costs (generally seen as forcing trade-offs: if you want more quality or better access, costs rise) in such a way that quality and access may rise while (average) cost may drop. Daniel is a strong proponent of large dedicated distance education systems (e.g. mega-universities; Daniel, 1996), which - by virtue of being able to spread quality investments over large enrollments - can deliver high quality to many at what the French would call a '*prix democratique*'.

To sum up: The conclusion of this first part is that distance education can, by its very structure, better than conventional systems capitalize on *scale economies*. As long as it can be

convincingly argued that quality 'simulated interaction' can be a substitute for real interaction, and as long customers accept this, as long this Fordist model of distance education remains viable.

The impact of new technologies on the cost structure of distance education

While with respect to the 1st and 2nd generation of distance teaching reference was made general to educational media, now technologies are the talk of the town. The difference is easily demonstrated but difficult to define. Text, traditionally regarded as a medium, can be displayed as print or on screen. The example seems to suggest that the media aspect is what is educationally relevant, not what happens back stage in terms of technology. A second look on the same example seems to cast doubt on the conclusion: there may be an educationally relevant difference between text on screen and printed text. Digital text can be better searched, modified, saved, distributed etc. all features relevant at least in the wider educational context. Kozma (1991, 1998) tries to capture the relation of media and technologies by characterizing a medium by symbol system, symbol processing capabilities and technology. Technology, he concludes, is of major importance since it enables and constraints the other two features of a medium.

What are the new technologies? They are all computer-based, hence digital. In fact, the computer provides the digital platform to seamlessly integrate all media from text, to sound, to still or moving images. This media *convergence* is a major efficiency gain given that 1st and 2nd generation technologies could not be exported from one format to the other. Before digital convergence distribution networks for each medium were separate. Now, on a networked computer you can play radio, see television, chat or skype, and engage in audio-conferencing or asynchronous text-based communication (CMC). This shows that once we have reached this stage of technological infrastructure the question of *technology choice* has lost its discriminating power. Choosing radio had major implications, e.g. in terms of constraints for teaching and learning as well as cost structure. Choosing networked computers has no such constraints: since you can realize completely different educational scenarios on the same technical platform. If we want to explore educational constraints and cost structure technology selection is insufficient, we need to determine the *educational scenario* (Baumgartner & Bergner, 2004).

The main difference in terms of educational scenarios depends on which aspect of the information and communication technologies (ICT) is used predominantly. As the term ICT signals: the digital platform can be used for *information* processing, distributing, sharing, retrieving, saving, manipulating, programming etc. Alternatively it could be mainly used to sustain communication between real people. Accordingly we can distinguish two broad types of applications arising from the ICT revolution relevant for distance education¹⁴: *Type-i applications*: These applications bring to bear the programming and information processing aspects of information technology. Searchable databases, simulations, interactive spreadsheets are points in case. One classical application is

¹⁴ The distinction is based on / borrowed from Rumble who writes: "a) Type A online systems offer Computer-Based Learning (CBL) involving textual, audio, and video course materials in electronic format. No student support is involved. b) Type B online systems offer Computer Mediated Communications (CMC) supporting tutor-student and student-student interaction. This support may be offered in synchronous mode (Type B1) or asynchronous mode (Type B2)." (Rumble, 2001, p.74-75)

modern language CD-ROMs which even allow the user to get into a simulated dialogue with a virtual tutor to control his/her pronunciation. The example illustrates already a major advantage of the ICT revolution: it has integrated different media on a common digital platform. Text-, audio-, and video-files, all can be seamlessly integrated on a common platform such as a Learning Management System. Naidu et al. (2000) report about a course in conflict mediation using a *Role-Play Simulation Generator* which the user is introduced in a virtual environment, in which he/she is confronted with concrete conflict situations and has to make choices. It is very obvious that the old idea of 'simulated interaction' to be built into course material can be developed to unheard of perfection. (cf. Figure 6: A rather low cost type-I application is the Costing Guide, Hülsmann, 2004, available at the COL website.)

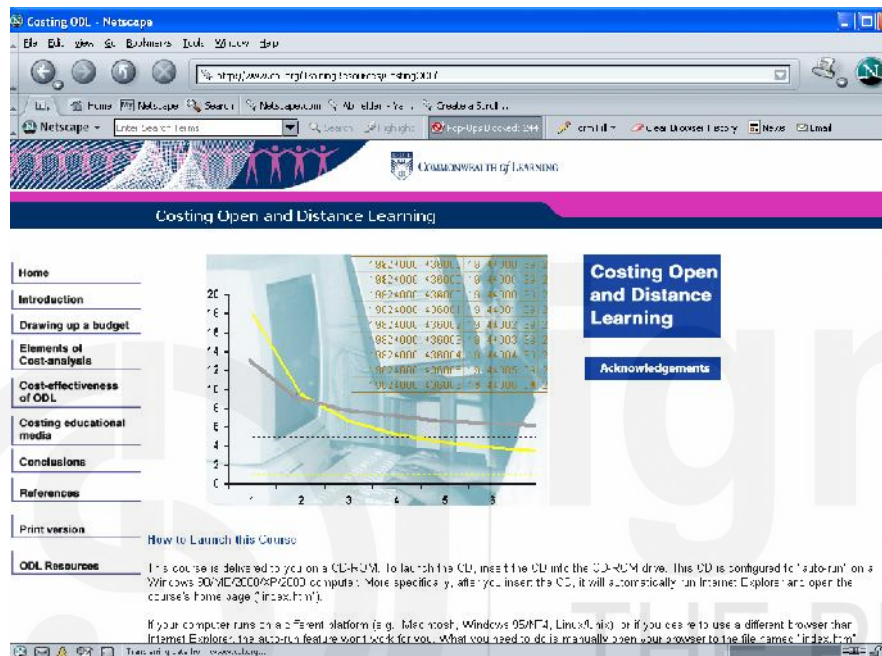


Figure 6: Type-i application; CBT

Type-c applications: These applications do not mainly draw from the information processing and programming capabilities of ICT. They focus on using technology for *sustaining real interaction* both in real time (synchronous technologies such as audio- and video-conferencing) and asynchronous text-based communication (often referred to as CMC, computer mediated communication; cf. Figure 7). Responsive interaction at a distance had been the weak point of traditional distance education. Its lack had become the organizing principle of distance education reflected pedagogically in shifting the focus from real to simulated interaction and organizationally to a systems configuration where the academic prestige is vested in course development rather than 'frontline contact with students'. Authors like Holmberg (1989) insist that the traditional system allows real interaction but others like Rumble (2001) give short thrift to the claim that this type of interaction can achieve comparative quality as a live discussion. Now, for the first time in the history of distance education responsive (real) interaction at a distance is possible.

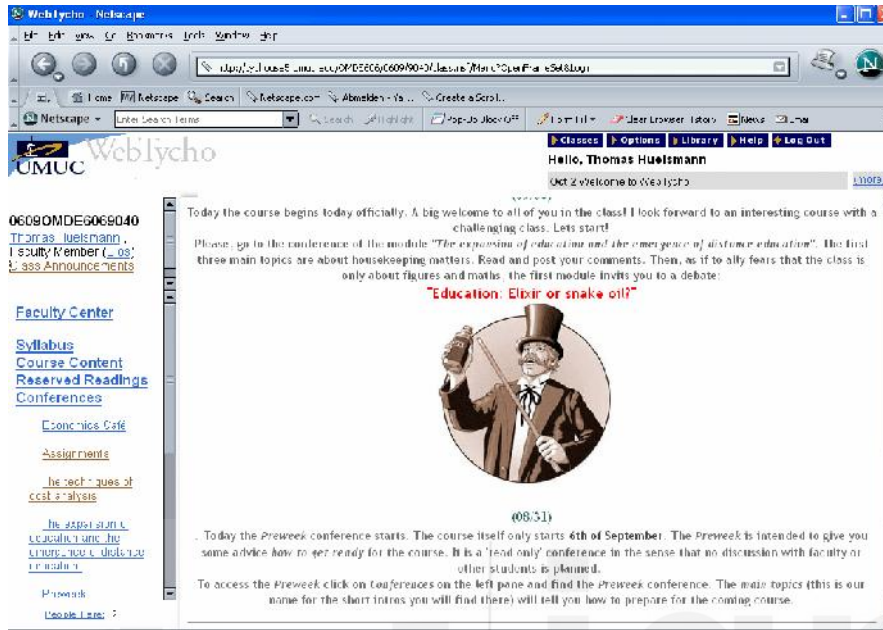
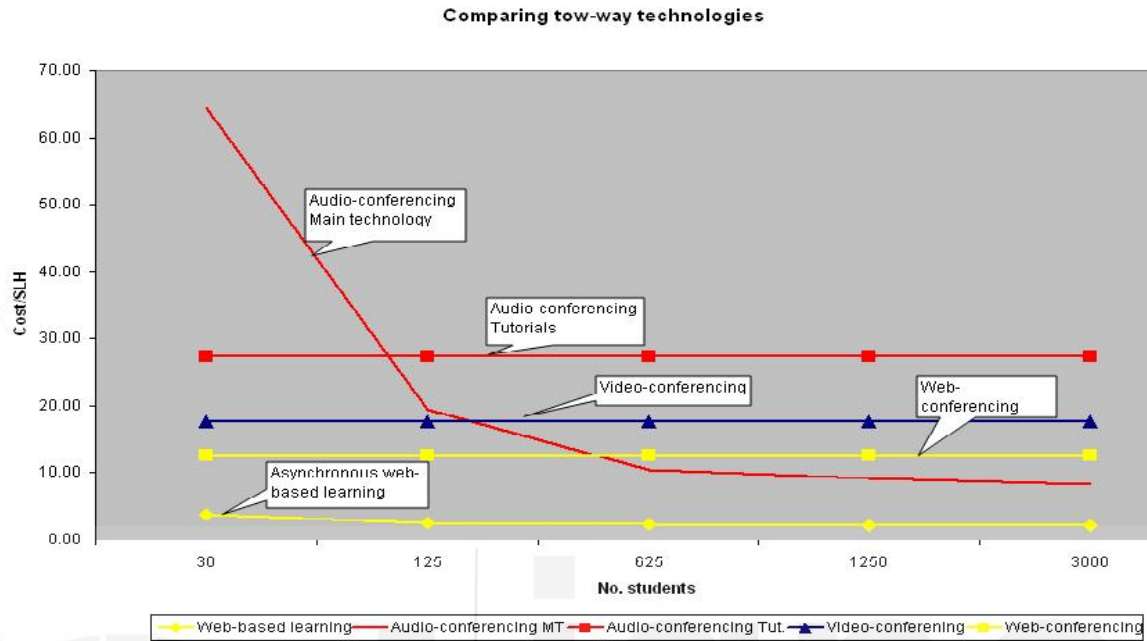


Figure 7: *Type-c application; a virtual seminar*

This seems to complete the last remaining deficit of distance education. Distance education has shown that it can excel in terms of course development. Now it can demonstrate also that it is capable of responsive interaction at a distance. This is the good message. The disturbing corollary of the very same message is that especially the type-c application of the new technologies 'drive horses through' all of the educational, institutional and economic structure of traditional distance education. Type-i applications can be easily integrated in traditional distance education since they are based on sophisticated simulated interaction much in line with the pedagogical orientation of first and second generation distance education. As usual simulated interaction can be objectified and produced mechanically. The cost-structure is well in line with traditional distance education also: potentially high development costs and low unit cost promise considerable scale economies.



Source: Based on Bates (2005)

Figure 8: Cost of two-way technologies

If we compare Figure 4 and Figure 8 we can see the different cost structure of traditional media and type-c technologies. Like the cost structure of the (direct) costs of classroom teaching there is almost no potential for scale economies.

The difference of cost structure can be easily gauged from the different potential for scale economies between courses of the first and second generation distance education and asynchronous text-based courses of more recent. The potential for scale economies can be measured by the quotient F/V. For the OU course this number is high (cf. Table 4: \$1 213 600 / \$ 164= 7400) as it is for the NKS course (cf. Table 4: \$140 000 / \$ 224= 625). The measure for potential for scale economies in the online courses are in the tens rather than the hundreds or thousands. It is obvious that in terms of scale economies the two formats play in very different leagues. This can be best seen by comparing scale economies evoked in both cases. Obviously we do not compare like with like here since learning hours, credits and enrolment numbers are completely different. However, the relationship remains highly indicative.

Table 4: Scale economies

Courses	F	V	Total costs	F/V
OU	\$1 213 600	\$ 164	TC = \$1 213 600 + \$ 164*N	7400
NKS	\$ 140 000	\$ 224	TC = \$ 140 000 + \$ 224*N	625
OMDE 601	\$ 15 700	\$ 292	TC = \$ 15 700 + \$ 292*N	54
OMDE 606	\$ 8 433	\$ 281	TC = \$ 8 433 + \$ 281*N	30

Source: Based on Hülsmann (2000; GBP deflated to 2004 US\$ and 2003a)

The classification of mediatechnologies with respect to time (synchronous/asynchronous) and interactivity (one-way traffic/two-way traffic¹⁵), already used for the type-i/type-c classification, can be expanded to include also the media/technologies of former generations.

¹⁵ The distinction is based on Holmberg; Moore & Kearsley distinguish between three types of interactive formats student content, student teacher and student student. Hülsmann distinguishes between internal and external interactivity, a distinction along the lines of Holmberg's simulated and real interactivity.

Table 5: *Classification of media and technologies*

	one-way (o)	two-way / peer (t)
Synchronous (s)	<i>Radio</i> <i>Television</i>	<i>Telephone</i> Audioconferencing Videoconferencing
Asynchronous (a)	<i>Print</i> <i>Audio-cassettes</i> <i>Video-cassettes</i> CD-ROM DVD	e-mail Computerconferencing

Note: 1st and 2nd generation technologies in italics.

Table 5 is a double entry table and as such leads to the following four combinations: s/o; a/o; s/t; s/o. Table 6 evaluates the types of technologies with respect to four criteria which seem of central relevance to distance education: Flexibility, Access, Costs, and Teaching & learning. This evaluative framework FACT allows succinctly summarizing the most important characteristics of types of technologies¹⁶.

The essential observation is the trade-off between responsiveness at a distance and scale economies. 1st and 2nd generation technologies were essentially one-way allowing at most *simulated interaction* while especially the new conferencing technologies allow *real responsive interaction* but trading-off the advantages of traditional distance education built around scale economies. There are new technologies building on simulated interaction and, as described above, perfecting the arts of simulated interaction to a hitherto unimaginable level. With the sophistication of these applications raise the fixed costs of course development. However, this format of new digital technologies (of type-i) is well compatible with the cost-structure of traditional distance education. If the market of users is large enough average costs could be kept modest.

The fundamental challenge comes from the type-c technologies. Addressing the birth handicap of distance education (lack of responsive interaction at a distance) they invalidate the rationale for migrating the focus of the teaching and learning transactions from real interaction to simulated interaction. 'Why should I design interactivity in a text, if I can embed the text in real interaction?'

However, embracing type-c technologies means that distance education loses the pedagogical, institutional characteristics which made it, in the words of Otto Peters an educational approach *sui generis*. Distance education, in its new guises, moves tendentially mainstream and *Daniel's triangles* cannot be taken for granted any more.

¹⁶ FACT is a evaluation framework following the template set by Bates by his famous ACTIONS framework (Bates, 1995) or his later modification to SECTIONS (Bates & Poole, 2003)

Table 6: *Technologies FACT evaluation*

Type	Examples	Flexibility	Access	Costs (-structure)	Teaching and learning
s/o	Radio Television	Generally synchronous media constrain flexibility. However, recoding facilities have reduced limitations in terms of flexibility.	Good (especially for radio). In industrialized countries both media are ubiquitous. In developing countries radio is wide spread. This does not apply for recording equipment.	Generally one-way media have high potential for scale economies. - For radio low cost per SJH per student are recorded if scale economies can be exploited.	All one-way media require additional arrangements to ensure two-way communication. The combination of radio with correspondence is low cost though correspondence is not seen as responsive interaction
a/o	Print Audio-cassettes Video-cassettes CD-ROM DVD	Generally asynchronous media are rather flexible. This applies especially for print. More recent media (CD-ROM, DVD) depend on a more sophisticated infrastructure with respect to the learner.	Print is widely accessible but requires literacy (an access hurdle audio or audiovisual media better overcome). Access to more modern media such as CD-ROM, DVD depends on the availability of a more sophisticated infrastructure.	Generally one-way media have high potential for scale economies. Cassette media are for very large batches of learners less cost-efficient because of there higher unit cost (aggregate variable cost per student). Modern media may have very high development costs which require mass distribution to bring down average cost per learner.	All one-way media require additional arrangements to ensure two-way communication. Cassette media have advantages as compared to the transient broadcasting media. Digital media allow much higher developed 'simulated interaction' (e.g. multiple-choice questions, searchable databases, simulations, interactive spreadsheets etc.)
s/t	Telephone Audio-conferencing Videoconferencing	Synchronous media generally restrain flexibility. This applies a fortiori to synchronous communication media bringing together teacher and student; however, some synchronous media (e.g. Breeze a mainly audio-conferencing technology) allows recording synchronous interaction for asynchronous use.	Access to digital communication media is even in industrialized countries limited. It is dependent on the availability of a developed ICT infrastructure. Telephony is more ubiquitous in industrialized countries but not an option as 'main teaching medium'.	Generally two-way media have low potential for scale economies and therefore cannot be expected to be cost-efficient. Conferencing media generally are used in a classroom format. This means it is characterized by semi-variable costs. While there is little potential for scale economies the model in principle can be scalable and sustainable.	Telephone as single medium is insufficient for most teaching transactions. Audio and videoconferencing simulate largely the classroom model. Some features such as whiteboard sharing may suggest some added value compared to a traditional classroom.
a/t	e-mail Computer conferencing (CMC)	For communication media flexibility for one finds its limits in the flexibility requirements of the others. CMC is largely applied in a virtual seminar (classroom) format hence requires some pacing. It is a viable compromise between flexibility and responsive interaction at a distance	Access to digital communication media is even in industrialized countries limited. It is dependent on the availability of a developed ICT infrastructure. Text-based asynchronous communication does not necessarily require large band-width (especially with LMS which use replication technology).	Generally two-way media have low potential for scale economies. Being characterized by semi-variable costs its viability depends on class size. Course development costs can be low but quality consequently depends more on faculty qualification.	Asynchronous text-based computer conferencing seems to be the best compromise between flexibility requirements of the adult learner and responsive (real) interaction at a distance. Recent Learning Management Systems (LMS) allow embedding simulated interaction and even synchronous interaction.

The rationale for expecting distance education being cost-effective was based on its potential for scale economies. The source of scale economies is rooted in migrating the focus of educational transactions from real to simulated interaction since responsive interaction at the distance was technically not feasible. It is now. We can migrate back. Do we want it?

Some distance educators see their values challenged here. Daniel's triangles nicely illustrate that costs (average costs) are controlled by broadening access, inviting more people in, instead of excluding them. Many distance educators see the linkage between cost-efficiency and access. Opening access was and for many still is a core value of distance education, which should not easily be jeopardized. The question how to recover lost efficiencies may, under this perspective, be more about than costs.

Recapturing lost efficiencies

There are two main options for *recovering lost efficiencies*: one relates to the information processing character of digital technologies and is related to *learning objects (LO)*; the other relates more to their communication sustaining character and is related to the issue of *cooperation*.

A learning object is defined as 'a digitized entity, which can be used, reused or referenced during technology supported learning' (Rehake & Mason, p. 21). The digital environment allows to treat a course as a 'quarry' and dig for 'nuggets', such as specifically useful simulations, pictures, references, arguments. If for example for a specific course in physical geography a complicated interactive climate model has been developed, it is possible to store it as a learning object, which, in principle, could be archived, re-used, re-purposed and shared by being integrated into alternative contexts.

The ease, with which this can be achieved, contrasts visibly with similar efforts before pictures, words, films, texts, all being processed on the same digital platform. In earlier days, before *convergence*, each medium had its specific channel, over which it was presented and distributed. A picture in a book cannot be used in radio and films not displayed in a book. The separate media formats and distribution channels produced, viewed from the present perspective, gross inefficiencies. Digitization allows seamlessly embedding all sorts of media (.doc, .tif, .wav, .AVI, .mp3, .3gp, .MPEG etc.) in the same digital learning environment and allows to export these files from one course, and increasingly also from one Learning Management System (LMS), into another. Research is underway to itemize standardized learning objects (e.g. SCORM: Shareable Courseware Object Reference Model).

Usually we depreciate fixed costs of course development over fixed shelf lives. The ease to modify courses 'on the fly' increasingly makes the determination of definite shelf life increasingly obsolete. Moreover, the digital format of courses not only allows stretching the shelf life (and by implication the number of learners over which costs of development can be spread), it allows also to re-use and re-purpose specific learning objects (especially those to which possibly large development costs are attached) for different contexts or courses. This means that substantial elements of a course could be depreciated not only 'longitudinally' along the shelf life of a course but also in a cross-sectional manner ('vertically' over different courses) by re-purposing them in different applications.

The visions by which the use of learning objects is inspired, however, vary considerably: Some imagine a 'Lego block' situation, in which the learner can customize his/her learning content by combining blocks of Learning Objects (LOs). In this case it is advisable to design the LOs in a highly interactive manner (simulated interaction). The aim would be (quite similar to the shift in traditional distance education from real interaction to simulated interaction) to facilitate scale economies by taking the teacher off the loop, or at least reducing his/her role. Here the aim is cost-efficiency (reduce cost at constant outcomes).

Others see LOs as a means to increase teacher productivity (i.e. strengthening rather than reducing his/her role). The LOs for the online teacher are what the textbooks are for the face-to-face teacher: they serve as sources of ideas for the teacher to motivate students and making teaching more effective. Here the aim is *production-efficiency*: increase outcomes at constant cost.

The vision that the availability of rich resources of Los (Table 7) could lead to learning communities would bring humans into the loop but the economic effect would be similar to the 'lego block' model where automation would render the teacher superfluous.

Table 7: Learning objects

	Lego blocks	Brick and mortars	Learning communities
Primary goal	Make learning as scalable, economically viable and effective as possible	Make learning as scalable, economically viable and effective as possible	Make learning as scalable, economically viable and effective as possible
Primary means of achieving goal	Automation: Design to remove humans from the loop	Productive tool: Design to make teachers more productive	Collaboration: Design to bring humans into the loop (possibly rendering the teacher obsolete)

There are no hard figures which can substantiate the hypothesis that learning objects contribute to efficiencies¹⁷. While there is some plausibility in the observation that re-using re-purposing chunks of digitized material, there are questions about quality if LOs are patched together without re-editing them for customized use. Also there is need to find out more about best management of such digitized reusable entities. To keep them nicely tagged in searchable databases may lead to rich resources in which to find the right thing merely by tagged keywords is as unlikely as finding a needle in a haystack.

Moreover, a costing model, which goes below the level of courses and seeks to cost the development of learning objects for all courses, in which it is used makes sense only where the respective learning object had been extremely costly (such as the interactive climate model referred to above). Institutional costing practices and templates for doing this have not yet been developed.

In spite of the difficulties in measuring the exact impact in terms of increased efficiencies, distance education managers should watch the developments related to learning objects closely. The second option for recapturing lost efficiencies is *cooperation*. Distance education is, as the early theorists have declared, complex systems with a number of major components e.g. a subsystem of material production and a subsystem of student support (cf. Rumble, 1997; Moore & Kearsley, 2005). All these components must be available for good distance education to function. However, it is not necessary that all components are hosted at the same institution. It could be imagined that various systems components could be distributed over several institutions in form of cooperation. Rumble and Rumble (2004) give the most comprehensive set of motives to engage in such models of cooperation. Their list, somewhat abridged (i.e. leaving out the reference examples, substituting numbers instead of bullet points in order to facilitate later referencing) include (Table 8):

Table 8: Reasons for cooperation

Consortia, partnerships, strategic alliances etc. are formed by educational, training and corporate providers for a variety of reasons, but principally to: - share costs or spread these over a larger number of students; - share courses, resources and academic and commercial experience and expertise; - attract funding opportunities (particularly in the European Union which makes inter-institutional collaboration a condition of funding); - be fast to market or cope with major market demand by joint course development and optimizing complementary strengths, as shown by Open Learning Australia in its earlier years of operation - capitalize on partners' knowledge of, and reputations in, local markets; - accommodate other countries' governmental requirements for local institution involvement as a condition of entry; - ensure adequate provision of local services such as marketing, counseling, admissions, registration, and examination invigilation; - de-bundle learning materials, tutorial support and course assessment to provide expanded market opportunities; - Achieve a franchise arrangement.

Source: Selected from Rumble & Latchem (2004, p.128)

¹⁷ Diana Laurillard of the UKOU argues that 'generic and customisable resources', i.e. learning objects, can lead to considerable reduction in production staff time: "If 100% ICT material is generated new: Academic staff time increases by 15%; production staff time increases by 120%; if 60% generic and customisable resources are used: Academic staff time increases by 10%; production staff time increases by 20%. Hence: need for costing and planning tools" (Laurillard: Balancing the benefits and costs of learning technologies (No date))

Bernath & Hülsmann (2004) have demonstrated how a small institution like the Center for Distance Education at the Carl von Ossietzky University Oldenburg can exploit the synergies of alliances and partnerships. They described a number of such models of co-operation in which ZEF supplied different system components at mutual benefits.

1. "The Branch Model: ZEF co-operates with the FernUniversität in Hagen (the main distance teaching university in Germany) to provide educational counseling and tutorial services to their students in the North Western regions of Germany. For the state of Lower Saxony this is a low cost option since local students are qualified at marginal costs. At the same time this arrangement contributes to the efficiency of the FernUniversität Hagen.
2. The Subcontractor Model: ZEF co-operates with the University of Maryland University College (UMUC) to develop and teach online courses within the Master of Distance Education (MDE) jointly offered by UMUC and Oldenburg University.
3. The Shared Ownership Model: ZEF co-operates with three centers for distance education at other universities in Lower Saxony to operate a technical infrastructure for online distance education (Via Online). This again is an efficient way of capacity building, which allows the participating centers to offer services to their own universities as well as selling services to outside clients.
4. The Franchise Model: ZEF has developed course material for professional development in nursing which has been franchised to other universities. In this case ZEF operates as a curriculum developer and content provider. The cost-efficiency depends on scale economies which can only be achieved in such broad alliances." (Selected from Bernath & Hülsmann, 2004, p. 485-6)

Michael Moore even regards such 'network systems' as 'the emerging organizational paradigm' and writes:

"In the *strategic alliance*, participants in a network contribute technological and managerial expertise and capital and share the costs of developing new technologies, spreading the financial risks of entering new markets. Although quite common in the manufacturing industry, in distance education so far, strategic alliances have not made much headway in collaborative design and delivery of the products, that is, courses and programs. Rather, they have been directed towards cooperative marketing of their existing courses.

However, in the distance education field, it is not only the strategic alliance but also the *vertical disaggregation* form of network that is likely to be of greater interest in the future. Vertical disaggregation is the process developed in the manufacturing industry to deal with shortening product life cycles, by which large firms outsource the production of various components of the product to smaller suppliers. As in manufacturing, in the knowledge industries too it looks as if vertical disaggregation will become the means of reducing product life cycles and improving efficiency and quality. What that means in distance education is outsourcing some of design and a lot of the product development of course materials. It means devolving learner support services to local points of contact and specialized services. It means drawing in instructor resources from wherever they may be located rather than solely on the faculty on campus." (Moore, 2003, p. 4; emphasis added, TH)

It is tempting to interpret Moore's characterization of distance education as 'network systems' as again a new re-specification of Peters' formula as distance education as most industrialized form of teaching and learning. Peters himself has suggested a re-specification in the context of the debate on Fordism in distance education. Industrialization has changed since the seventies and distance education needs to change accordingly.

To wrap up:

1. Distance education moved nearer to the mainstream education (convergence); there are many organizational formats; very different usages of technology
2. Distance education cannot anymore seen as per se more cost effective; Daniel's triangle applies only for some strands of distance education

3. Especially the appearance of responsive interaction (type-c applications) has challenged traditional distance education as is core
4. Care must be taken to define the appropriate learning scenarios and institutional arrangements
5. The challenge is to make the possible advances of responsive interaction (and its implied trade-off of scale economies) compatible with the moral requirement for access.

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UNIT 3:

COMPARATIVE COST ANALYSIS IN DISTANCE TEACHER EDUCATION

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Abstract: Distance education is often hailed as the answer to African governments' problems of educational provision. Claims are made that DE can improve the access to, and quality of, educational provision and at a lower unit cost. Distance education is chosen because of its power to stretch educational resources. It is indeed true, DE can provide greater access to quality education at a lower cost than conventional education – but so often it fails in one or more of these important elements.

This paper seeks to identify the important issues in the comparative cost analysis of distance and conventional teacher training in Rwanda. It considers:

- coherence of student profiles
- the effects of student drop out
- economies of scale

The paper will show that in gross terms, the KIE distance teacher training programme is nearly 20% cheaper than the campus-based programme. However, if adjustments are made to take key issues in costing into account, then this differential is increased to make distance provision much more cost effective than the conventional programme.

Background

The Government of Rwanda (GoR) has set itself a goal of UPE by 2015. Like many countries in sub-Saharan Africa, Rwanda has a high proportion of unqualified teachers. A research study carried out by UNESCO showed that more than 65% of secondary teachers in government and government-aided schools in Rwanda are unqualified (Drique & Wassehove 2000). A later study (Douse 2003) shows that 48% of secondary teachers have D6/D7 or lower. The GoR has made many advances in the education sector post genocide and enrolment in secondary education has trebled from 50,000 in 1995 to nearly 170,000 in 2003. (World Bank 2003)

The Revised Education Sector Policy Document published by MINEDUC in 2002 makes the following policy statements:

- Teachers at all levels shall be trained in sufficient number and quality.
- Both pre-service and in-service teacher training methods with the use of distance learning shall be strengthened.

In 1998, GoR created Kigali Institute of Education (KIE) to take responsibility for teacher training in the country. In 1999, KIE admitted 300 students to its pre-service programme and they will graduate in 2003. It was quickly realised that the conventional pre-service training at KIE could not train the large number of unqualified serving teachers needed to cope with increasing secondary enrolment.

KIE started delivering the first national distance training programme (DTP) for teachers in December 2001. The Department for International Development of the British Government (DFID), agreed to fund programme set-up costs, development and delivery for the first cohort of 500 students. This cohort is expected to graduate with Diplomas in 2005.

Aims of the study

The primary aim of this study was to find out which of KIE's teacher training programmes produces qualified secondary teachers at the lower unit cost: the full-time, campus-based programme or the part-time distance training programme.

In the study, a comparison is made between the costs of providing the first 3 years of the full time degree programme and the 4 year, part-time diploma programme.

Summary

A comparative costing analysis carried out on the KIE pre-service and in-service teacher training programmes revealed that the following (based on the number of students at 01 October 03):

The cost per student for 3 years of the preservice programme is
FRW 3,731,637 (3789 students)

The cost per student for 4 years of the inservice distance training programme (equivalent to 3 years pre-service) is
FRW 3,027,451(474 students)

This means that, in gross terms, the distance training programme costs 81% of the pre-service programme.

Issues in comparative costing

There are many issues involved in costing different educational options, especially when distance education for serving teachers is involved. The 4 main issues are:

- coherence of student profiles
- the effects of student drop out
- economies of scale
- cost implications for government

Coherence of student profiles

There are important differences in the profile of students of the KIE pre-service and in-service programmes. Compared to KIE pre-service students, DTP students tend to:

- be older
- be working full time as lower secondary teachers
- have family commitments
- have lower educational qualifications
- have not studied for many years
- be highly motivated to gain their qualifications and improve their standard of living
- want to improve their knowledge in order to be better teachers.

These differences have implications for the design of the distance training programme but should also be noted by policy makers. The higher level of motivation and commitment to teaching (especially in rural schools) amongst distance students is an important factor in this cost analysis.

The effects of student drop out

If high numbers of students drop out of teacher training programmes or do not join the teaching profession after graduation, this has an impact on unit costs. Drop out of KIE programmes is generally low.

By the end of Year 2 in the 2001 entry cohort on the pre-service programme, dropout was 6%.

By the end of Year 2 in the 2001 entry cohort on the DTP, dropout was 5%.

Low student dropout is a feature of fully-funded teacher training programmes throughout Africa. (Perraton 1993, MUSTER 1999)

However, there is another aspect which must be considered – how many graduating students of the pre-service programme ultimately join the teaching profession? Research carried out with the 2001 pre-service cohort at KIE indicates that 40% will probably choose not to enter teaching when they graduate. This has an important effect on unit costs.

The unit cost for 3 years pre-service with only 60% graduates joining the teaching profession is FRW 6,231,160

If drop out from the distance education programme is also taken into account, at 5% per 2 years – we find a unit cost of FRW 3,188,915

**The difference in unit costs is now FRW 3,042,245 per student
or
the distance training programme costs 51% less per student than the campus based programme
(where only 60% of graduates join the teaching profession).**

**DTP unit cost (450 students) 3,188,915 x 100 = 51%
Pre-service unit cost (-40% students) 6,231,160**

Economies of scale

An overriding feature of distance training is expected economies of scale. This is related to the relationship between fixed and variable costs and the concept of marginal cost. A marginal cost is the cost of providing one more unit of the product or service, i.e. in this case of adding one more student to the programme. For example:

If the DE student cohort is increased by one, the marginal cost would be only the cost of printing one more set of materials and the marking of one more examination script. The fixed costs of the programme would not be affected. This could also be true of conventional programmes. Increasing the number of students by a small amount would probably not have any effect on the costs.

However, if the distance training programme cohort is doubled, (studying the same subjects) the marginal costs are still relatively small – 500 sets of materials, 500 more exam scripts plus student travel and accommodation. Existing student support staff and facilities could accommodate the increase in student numbers. NB These marginal increases are even less if there is a smaller component of face to face than currently provided in the DTP.

Illustration

If we increase the number of DTP students to 1000, the marginal costs would double (those costs which increase with the number of students on the programme). This gives a total programme cost of just over

FRW 1,000,000,000 (one billion Rwandese francs) and a unit cost of
FRW 1,000,000 (one million Rwandese francs.)

This is about 25% of the unit cost if only 450 students were to complete the programme.

However, if the cohort on the pre-service programme was doubled, KIE would need to expand the infrastructure of the college to provide more classrooms and laboratories, more student accommodation, double the government bursaries, increase capacity in the library, computer labs etc. A considerable increase in teaching staff and some academic and support staff would be needed if teacher-student ratios were not to increase to an unacceptable level.

Table 1 shows the cost of staff salaries as a percentage of the total KIE expenditure per annum (excluding DTO staff costs). It also shows the staff cost per student each year.

Table 1: KIE salaries as a percentage of total annual expenditure

Year	KIE expenditure	Staff salaries	%	Student Numbers	Staff cost per student
99/00*	647,000,000	250,000,000	39	638	391,850
2001	854,192,000	363,642,000	43	889	409,046
2002	1,677,098,531	1,006,247,540	60	1229	818,753
2003	1,895,457,711	1,032,519,699	54	1671	617,905

This would seem to be in line, or even a little lower, than the findings of the MUSTER researchers, who found that staff salary costs typically account for between 50% and 90% of all recurrent costs per student (Lewin 1999).

Table 2 shows the cost of student bursaries (for full-time students) as a percentage of the total KIE expenditure per annum. It also shows the unit cost per student each year

Table 2: Bursaries to pre-service students as % of total annual expenditure

Year	KIE expenditure	Student bursaries	%	Student Numbers	Unit cost
99/00*	647,000,000	182,000,000	28	638	285,266
2001	854,192,000	282,000,000	33	889	317,210
2002	1,677,098,531	338,710,000	20	1229	275,598
2003	1,895,457,711	417,500,000	22	1671	249,850

Between 20% & 33% of KIE annual expenditure goes on bursaries to students. If KIE developed a mixed mode of pre-service training, utilising the distance training materials, with some school-based training and teaching practice and shorter residential periods, this percentage could be reduced.

The difference in the balance of the variable/marginal costs between the two modes of delivery means that KIE could significantly increase the number of students on the distance training programme and the cost per student would decrease substantially. This is not true for the campus-based pre-service programme.

Cost implications for government

In-service teacher training by distance education allows teachers to continue working while they improve their qualifications. This has 2 important implications for government salary costs:

- There will be an increase in the government teachers' salary bill once 500 teachers gain diplomas through the DTP.
- The cost of taking in-service teachers out of the classroom if there were no distance training programme.

a) Increase in the government teachers' salary bill once 500 teachers gain diplomas through the DTP.

The entry qualifications to the DTP are D6/D7 – which is equivalent to 6 or 7 years of secondary education – and no teacher training. The salary for this level (with housing and transport allowances) is in the range FRW 48,000 – 23,000 with 10 incremental steps. If we assume that on average DTP students had 5 years experience when they joined the programme, then the average monthly salary is FRW 35,500.

Monthly salary 35,500

No. of students x 500

17,750,000 per month for 500 unqualified teachers

The salary for a teacher with a diploma (with housing and transport allowance) is in the range FRW 62,000 – 32,500 with 10 incremental steps. When DTP teachers graduate they will have, on average, 9 years teaching experience which will give them a qualified teacher salary (Diploma + 9) of FRW 56,100.

Monthly salary 56,100

No. of students x 500

28,050,000 per month for 500 Diploma holders

If we allow for a further 5% drop out in the remaining half of the programme to take us to 450 students then the monthly government salary bill will be FRW for the 450 newly qualified teachers (NQTs).

Monthly Salaries 450 NQTs 25,245,000 -
Monthly Salaries 500 UQTs 17,750,000
 $7,495,000 \times 12 = \text{FRW } 89,940,000$

So the government monthly salary bill will increase by approximately FRW 7,495,000 per month if 450 DTP students graduate and continue to teach.

The increase in MINEDUC annual salary bill of 450 teachers gaining Diplomas is approximately FRW 90,000,000.

b) If there was no DTP then all teacher training would be full-time, campus-based.

What is the cost of taking the in-service teachers out of schools in order to teach them full time?
What would be the cost of replacing them?

If there was no DTP and the only form of teacher training was full-time on campus at KIE or NUR, then GoR would have to replace the teachers while they attended classes (as well as pay their salaries). This is a hypothetical issue as there are no teachers available to replace them, but assuming they could be replaced with other, unqualified teachers, then the figures would look like this:

Monthly salary 23,000 (unqualified teachers, no experience)
No. of students x 500
11,500,000 per month
Months of programme x 36
Additional salary bill 414,000,000

The additional cost to MINEDUC of replacing in-service teachers (with unqualified teachers with no experience) if they were to attend classes full time is FRW 414,000,000 over the 3 year programme.

Conclusions

The primary aim of this study was to find out which of KIE's teacher training programmes produces qualified secondary teachers at the lower unit cost.

The figures show that even with a completing cohort of only 450 students, the unit costs are lower for distance training than for the conventional programme.

DTP unit cost (450 students) $3,184,725 \times 100 = 51\%$
Pre-service unit cost (60% students) 6,231,160

The effects of economies of scale showed that a 100% increase in the size of the cohort would result in a decrease in DTP unit costs to about 16% of the cost of the conventional programme.

DTP unit cost (1000 students) $1,000,000 \times 100 = 16\%$
Pre-service unit cost (60% students) 6,231,160

Therefore it is clear that the distance training programme produces qualified secondary teachers at a lower cost than the conventional pre-service, campus-based programme.

Comparing teacher training programmes

A comparison of the features of each of the KIE teacher training programmes reveals important differences.

In-service distance education programme	Campus-based pre-service programme
Lower unit cost	Higher unit cost
Lower capital expenditure	Higher capital expenditure
Lower marginal costs	Higher marginal costs
Lower fixed and higher variable costs	Higher fixed and lower variable costs
Benefits from economies of scale	No benefit from economies of scale
Graduates more likely to remain in teaching	High proportion of graduates likely not to become teachers
Low drop out	Low drop out

Of course, programmes do not only have a cost, they also have a value. There is a value to MINEDUC of creating a cadre of trained distance educators in Rwanda. This programme has touched the working practices of many educators:

- More than 30 full time professional staff in DTO
- More than 80 writers
- More than 80 part time Subject Tutors and Heads in regional distance training centres
- 500 unqualified secondary school teachers

If the KIE DTP is only the first of many national distance training programmes in Rwanda, then a valuable resource has been created from which those programmes can draw.

Distance education is the only possible form of education for some individuals. It allows us to offer programmes to different groups of potential students:

- those who are working full time
- those who live in very rural areas
- those who are physically prevented from travelling or living away from home on residential courses
- women who cannot or will not leave their family responsibilities to fulfil their own educational aspirations
- those who had a bad experience previously in the formal education sector and want to return to complete their education

Recommendations

A comparative cost analysis of teacher education programmes inevitably leads to recommendations for educational policy makers.

GoR Policy Objectives

In the Education Sector Strategic Policy Document (2002 pg 27), Policy Objective Secondary Education 7, states a GoR objective to:

Ensure quality teaching in secondary schools

The indicative targets for this objective are:

1. The percentage of qualified secondary teachers will be increased by 5% per year
2. The number of teachers upgrading by DE will be increased from 500 to 1500 by 2008

The stated strategy in response to this policy objective is to increase the number of qualified teachers through in-service training, including distance education.

On the basis of the stated objectives of this study, the following ten recommendations are offered for consideration by MINEDUC

Kigali Institute of Education

1. Consider the selection procedures for the KIE pre-service programme and take steps to ensure that drop out is minimised and a high percentage of graduates join the teaching profession. This may include some form of bonding agreement.
2. Ensure that the KIE distance education programme can be funded sufficiently from government budget to ensure the continuation and expansion of the programme.
3. Investigate cost-sharing mechanisms for the DTP.
4. Ensure that a programme of research into the effectiveness of both the in-service distance teacher training programme and the pre-service programme is instigated, including tracer studies for the first cohort graduating from the pre-service programme in 2003.
5. Consider a mixed mode of training for pre-service teachers which includes distance education and school-based training as well as residential periods on campus.

Higher Education

6. Continue to train managers of HEIs in programme costing and require them to carry out cost analyses of existing programmes.
7. Require HEI managers to consider different modes of delivery and produce projected unit costs of all planned new programmes before implementation. Other Education Sectors
8. Investigate the use of open and distance learning for other programmes, such as alternative secondary programmes for adult returners and out of school youth, adult literacy, technical and vocational training, and continuing professional development in other sectors.

Distance Education Policy and Strategy

9. There is an urgent need to develop a national policy & strategy for distance education to ensure that there is a coherent plan for the use of DE in all phases of education in Rwanda and to prevent 'ad hoc' programmes from being developed and resources duplicated.
10. Institutional policy frameworks need to be developed to take into account the move towards a dual-mode approach. This approach, which sees distinct DE programmes offered alongside traditional face-to-face programmes, should develop towards a flexible-learning mode approach, in which course designers select from the full range of methods available, the right one for a particular group of students or to attract previously uncatered-for students.

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UNIT 4:

THE COSTS AND COSTING OF NETWORKED LEARNING

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Introduction

Until the late 1950s there was relatively little interest in the costs of education, and virtually none in the costs of educational technology. This failure reflected the fact that innovation in teaching methods was a largely marginal activity: as one early analyst put it, 'education's technology, by and large, has made surprisingly little progress beyond the handicraft stage' (Coombs, 1968: 7). However, the rising demand for and escalating costs of education led to attempts within the newly developing sub-discipline of the economics of education to quantify both the efficiency of public expenditure on education, and the economic benefits of providing it (Vaizey, 1958; Schultz, 1961). Educational technology came to be seen as a way of improving the efficiency of education through productivity increases. As a result analysts began to research into the costing of educational technology and the actual costs of distance education systems (for a fuller account of this work, see Rumble, 1999).

Much of the early work undertaken under the auspices of the World Bank, UNESCO and USAID focused on the costs and cost structures of educational broadcasting projects (Jamison, Klees and Wells, 1978; Eicher, 1980; Eicher et al., 1982; Orivel, 1992). Within the UK other experts focused on the costs of using educational technology either for distance teaching or as a substitute for classroom teaching on campus (Fielden and Pearson, 1978; Crabb, 1990; Rumble, 1986a, 1988). Some of this work was developed further in Australia within the context of universities mixing traditional and distance education approaches (Rumble, 1986b; Deakin University, 1989).

The development of networked learning has once again raised similar questions as policy makers and analysts ask both whether networked learning is cheaper or more expensive than other approaches to education, and what needs to be taken into account in costing such systems.

Frameworks for costing

The key to much of the early work lies in the attempt to identify clearly the nature of the costs involved, and what drives them, so that not only can all the relevant costs be taken into account, but also their behavior within planned or actual systems can be modelled.

So far as the nature of the costs is concerned, most studies adopt the conventional distinction between capital costs (buildings, equipment and furniture) which are annualized over their expected life, and revenue costs. The latter are normally categorized as staffing costs (including on-costs) and non-staffing costs (covering revenue expenditures on premises, stocks, supplies, consumables, and expenses). Generally capital costs have been regarded as non-recurrent costs - though the short life of some capital items, particularly in the IT area, means that institutions are increasingly treating such budgets as a recurrent item that is treated in much the same way as revenue budgets are. On the other hand, revenue expenditure on the development of course materials (which involves considerable expenditure on labor) in fact behaves very much like capital expenditure, incurred when the course is designed but expected to retain some value over the expected life of the course.

While annualisation of traditional capital costs is commonplace, the annualisation of course development costs is less so. The failure to annualise course development costs is problematic given that the length of life over which courses last is a major factor in the overall efficiency of technology-based education.

At the macro-level the costs of any system are driven by a combination of the following factors, all of which are susceptible to management control:

- Course populations
- The number of courses offered
- The lengths of course lifetimes
- The media and technologies chosen
- The extent to which cost-inducing actions, for example, the use of copyrighted materials, are avoided
- The extent to which costs are placed on students, either as tuition, or by moving the system boundaries so that activities the institution might once have paid for are now paid for by students (e.g. access to tutorial and library services)
- The extent to which the institution employs people on contracts *for* service (i.e. salaried posts) to develop courses and teach students, rather than on contracts *of* service (i.e. hired as casual labor, to be paid by the manuscript/script/tutorial hour/test marked, etc.)
- The extent to which the institution adopts working practices that reduce the costs of labor by, for example, designing courses to be wrapped-around existing textbooks rather than developing new materials, and using author-editor models of course design, rather than big course team models
- The use of technology to increase the student load per academic or administrator
- Increases in the teaching load of academic staff at the expense of other functions - for example, research and public service
- 'Labor for labor' substitution - the replacement of expensive academic labor by student and adjunct labor, in order to reduce staff costs.

An important element in costing is to understand the system being costed so that cost elements are not missed. Far too many analysts restrict their analysis to their own budget. Of course, understanding one's own budget and controlling it is important. The answers one obtains to questions such as 'How much will this cost me?' and 'Will doing it this way cost more or less than doing it that way?' will help one decide whether, from a purely parochial interest, one should or should not proceed with a given course of action. However, the wider one's span of interest, the more one will want to look at the macro-picture. Individual teachers may be content to find out whether teaching online, for example, takes them more or less time than teaching face-to-face, but departmental heads will want to know whether they can teach more courses and/or more students per course, and what the effect will be on their expenditure and their income.

Institutional heads will be concerned with all the above questions, but will also want to know what the impact is on administrative costs, while institutional heads and national educational planners may want to know whether teaching online is cheaper or more expensive than teaching face-to-face or by some other distance teaching methodology. Students will want to know whether taking a course online adds to their costs, or saves them money and/or time - and actually academics, course leaders, and institutional leaders should care deeply about student costs, since student decisions on whether or not to study with a particular institution will be driven in part by cost considerations. These considerations will go beyond the cost of tuition to cover the costs of engaging with the course ('Do I need a computer to study this course? What travel costs might I incur? How much will the materials I need cost me? Will I spend significant amounts of money online? What are there opportunity costs if I take this course?' etc.). This argues for a whole systems approach to the costing of projects that moves beyond the immediate concerns of individual course and departmental budgets to take account of the cost implications of the system as a whole on overhead functions and the customer.

The use of learning materials has already resulted in a sharp temporal differentiation between the design and delivery phases of the activity of teaching, with the design and production of complex

multi-media courses beginning many months before they are taught, thus separating these activities in time (and often across budget years). Once created, the materials can be packaged in various ways and used, often for a number of years, on a range of different courses. They can also be used by very large numbers of students. All this makes it less likely that a single member of faculty will control the whole teaching-learning process from materials design through to delivery. On large population courses the chances are that not only will most of the actual interaction and assessment of students have to be farmed out to auxiliary teachers, but much of the administration of the teaching-learning-assessment process will also be handed to professionals whose task it will be to seek economies of scale and process. Division of labor between those who design the materials, those who teach the courses, and those who administer and support student progress, follows. Indeed, the capital nature of the costs expended on course development, the division of labor that occurs in many systems, and the fact that materials once developed may be repackaged for use on a number of courses, argue for a clear distinction to be made between materials development and course delivery.

To date issues around the division of labor have been seen most clearly in distance education - most notably in large-scale 'first generation' correspondence systems, and in 'second generation' educational broadcasting and 'third generation' multi-media systems. This 'Fordist' tendency has been greatly criticized by those who see it as a reflection of the increasing degradation of academic work. It has been suggested that just as cottage-industry correspondence systems can be run by faculty who retain control over the whole teaching-learning process, so the development of online education allows faculty to teach at a distance without losing control of their course - and indeed this is true in some cases. However, a division of labor is likely to occur because in the long run any system that limits control of design and delivery to a single person limits both the range and sophistication of the materials that can be developed, and the number of students that can be supported, and is thus inherently cost-inefficient given the much greater economies of scale and process achievable in systems designed around the division of labor.

In addition, a range of more immediately personal issues arises for faculty involved in the development of materials. For example, will such an academic have to continue to teach traditional students in class at the same time as he or she develops the internet course? Will he/she be given time off to compensate them for the time spent developing the course, and if so who will help teach the traditional course? Will he/she be given no immediate help in the development of the course, but then be allowed - as happens in the French system - to substitute resource-based learning for personal teaching in the delivery phase, thus freeing up time that can then be spent on other more personal objectives (such as research and public service)?

To these issues must be added issues around the actual teaching of online courses, including such issues as the evolution of new academic roles such as e-moderating (Salmon, 2000), and the extent to which teaching online requires more or less time of academics.

So far we have focused on the use of the network for academic purposes - in essence as the location through which ethereal (i.e. non-physical) course materials can be accessed, and as the site through which electronic dialogue and discourse takes place. But a fully developed e-education system would use the network and website as the location for the administration of the learners' progress through the institution - that is, as the site through which students would electronically enroll, pay for their courses, change their records, and seek general counseling and advice. The development and maintenance of a web site to support academic and administrative functions must therefore be seen as an integral part of the provision of an e-education system, and hence of part of the costs of the system.

Those working within the teaching institution will of course be able to access the web site easily through the institution's own network - but remote tutors and students also need access to the web site. This generally means providing their own computing equipment and connections to the web - though occasionally an institution may help by setting up tele-learning centers where students (and tutors) can make use of institutional equipment to access the site. Either way, the costs of access/reception are an integral part of the system as a whole, and need to be taken into account, if not for budgeting purposes, then at least for purposes of cost analysis.

On top of these elements are the costs of managing an e-education system. In virtual education institutions these overhead costs will be obvious, but in dual mode systems there is the possibility that these costs can be set aside, at least for a while, in order to give the e-education system a 'free'

ride. Such free rides will not survive expansion, nor can they be ignored in cases where comparative costings between online and other systems are being attempted.

Thus the institutional costs of a fully developed e-education systems would include:

1. Developing e-materials
2. Teaching (and assessing) students online
3. Accessing the web site
4. Administering students online
5. Providing the infrastructure and support within which e-education can operate
6. Planning and managing e-education at the macro-level.

However, one is likely to find that the range of costs is very great. This arises in part because there are very different ideas as to what online learning actually is - varying from those who see it in terms of access to materials and to assessment schemes that favor multiple choice formats, to those who stress the communicative and constructivist nature of the dialogue that can occur between teacher and students, and among students. These different expectations of online learning are reflected in the costs of systems, making it hard to come to any concrete conclusions about their costs.

Costing online learning

In the light of the development of networked learning, a new generation of academics, interested in the impact of online learning on the costs of education, has begun to evolve a methodology by which to approach the task of costing such systems (Boucher, 1998; Whalen and Wright, 1998, Bacsich et al., 1999; Webb and Cilesio, 1998, 1999). None of these studies provides a wholly comprehensive approach to the costs of networked learning. Such an approach would require an analysis that looked at the costs of a system:

- (a) by expenditure category (using the traditional distinctions between human resource or staff costs, premises and accommodation costs, equipment and furniture costs, and the costs of stocks, supplies, consumables and expenses), and
- (b) by contributor (e.g. the institution's own budget, partner institutions' inputs, direct government inputs, aid agency inputs, staff inputs, and student inputs), while
- (c) distinguishing between capital and revenue costs, with the former, including the investment in course materials, annualized over their expected life, and
- (d) where this seems sensible to the analyst, using an appropriate systems framework for the analysis of costs.

If this provides a framework for the analysis of the costs of online learning, the next issue must be, exactly what kinds of costs are being identified, and how should they be treated? The first thing to say is that all the relevant costs should be identified. Secondly, costs should not be netted off from income since this hides the full costs involved. In fact, examination of the work done to date shows that the different analysts:

- Lack agreement on the costs that should be taken into account. This is particularly the case with regards to overhead costs (i.e. the costs analyzed here within the regulatory and logistics sub-systems) that are, in general, ignored.
- Employ very different labels or terms to describe what they are costing. This reflects jurisdictional and linguistic differences in terminology, local institutional practice, and personal preferences.
- Aggregate or disaggregate costs in different ways.
- Employ a variety of frameworks to give coherence to their work.

Appendices 1-3 look at the costs of online learning, using a functional approach as the primary thrust of the analysis to distinguish between the costs of online materials development (Appendix 1), e-education delivery costs including teaching, assessment, and web access (Appendix 2), and overhead costs (Appendix 3). Within each of the tables that make up these appendices, column 1 of the table provides a brief description of the kind of expenditure involved, and this is then categorized (column 2) by expenditure type, viz. human resource (staff), buildings and accommodation, equipment and furniture, stocks, supplies, consumables and expenses. Finally, in column 3, there is a series of notes on the treatment of these costs.

While I have tried to be inclusive in my approach, I am conscious that there may be areas of cost that have not been identified either in sufficient detail, or at all. The items of expenditure identified should be regarded as illustrative rather than definitive. Analysts can, of course, adopt a different schema if they feel that this will be helpful.

However, the attempt to be inclusive does raise important issues about the scope of any costing project - that is, just how wide a range of costs should be included? Within an institution, this revolves largely around issues to do with the treatment of overhead costs, but there are wider ramifications - notably, the contributions made by other stakeholders including students and staff (particularly pertinent if time and expenses are not fully reimbursed). Any study that seeks to compare the costs of one system with another (say, the costs of networked learning with traditional teaching, whether within a single institution or across institutions) should take a full-cost approach. Where this is not done, the comparison risks being misleading.

The costs of online learning

What do we know about the costs of networked learning? The major costs of e-education can be usefully considered under the three heads identified above - viz. the costs of developing web-based materials, the costs of e-education delivery, and the overhead costs of embarking on e-education. I shall take these in order.

A. Costs of developing online learning materials

Most of the technologies involved in Web-based courses have been around for a long time. They include the preparation of text, audio, video, computer-based tutoring, intelligent tutoring, exploratory learning, simulations, etc. What is distinctive is that these materials are now being put on a web site that can then be accessed by students. For many years distance educators have known that not only do media and technologies have their own cost structures, but also that some media are more expensive than others. Bates's analysis of the costs of various media concluded that print, audio-cassettes, and pre-recorded Instructional Television are the only media that are relatively low cost for courses with populations of from under 250 students a year to over 1000 student a year. In addition, radio is also likely to be low cost on courses with populations of 1000 or more students (Bates, 1995: 5). Hülsmann (2000: 17), on the basis of his study of the costs of 11 courses offered by 9 different European distance teaching organizations, argues that at £350 per student learning hour print is the cheapest medium to develop. Putting text up on the internet costs at least twice that, and possibly more. After that costs escalate through audio (£1,700), CD-ROM (£13,000), video (£35,000) and TV (£121,000).

These figures are based on averages across eleven courses in nine institutions, and hence need to be treated with care, given the wide variations in costs encountered in practice. However, the broad differences in media costs are carried through into the development of internet-based courses. Arizona Learning Systems (1998: 13-14) found a wide variation in the costs of developing a course, of from US\$6000 to \$1,000,000 for a three unit internet course, depending on the approach used. Much of this is the cost of academic and technical labor. The cheapest approach involved the presentation of simple course outlines and assignments; the most expensive, at \$1,000,000, involved virtual reality (see Table 1).

Table 1: *Cost of developing a three-unit internet course (US\$)*
(Arizona Learning Systems, 1998)

Course outlines and assignments	6,000
Text	12,000
Text with reference material	18,000
Text with reference material and images	37,500
Audio and video	120,000
Simulations	250,000
Virtual Reality	1,000,000

The high costs of developing internet courses are confirmed by Saba, who suggests that commercial software companies developing courses for online instruction or publishers are spending at least \$500,000 to fully develop a multimedia course (Saba, 1999).

There is some evidence that the lower levels of cost are more likely to be found on synchronous online courses, with asynchronous courses costing more. Certainly Whalen and Wright found significant differences between synchronous and asynchronous course development costs. The former required much less development time because they involved fewer media (Whalen and Wright, 1999: 32).

A high proportion of the costs of developing materials is labor costs. All the research shows that it takes more academic time to develop media that will occupy a student for one hour, than it takes to develop a one hour lecture - although how much more time is difficult to quantify. Sparkes (1984: 219) reckoned that it took from 2 to 10 hours to prepare a lecture, from 1 to 10 hours to prepare a small group session, and from 3 to 10 hours to prepare a video-tape lecture; however, it took at least 50 to 100 academic hours to prepare a teaching text, 100 hours to prepare a television broadcast, 200 hours to develop computer-aided learning, and 300 hours to develop interactive materials - to which in all cases one needed to add the time of technical support staff. Boettcher (1999a) suggests that it takes an average of about 18 hours faculty time to create an hour of instruction online.

Academic development costs can be reduced or at least kept in check by adopting cheaper approaches to course development - for example, author-editor models based on an editor working with consultant authors, instead of hiring permanent staff.

One of the problems with many of the studies now available is that they report the broad results, not the detail. It is therefore difficult to know what has been included and what excluded, and so whether the costings undertaken are comprehensive. Experience suggests, however, that all figures need to be treated with care. What does seem clear is that the costs of developing a course are being pushed up - and significantly so whenever media are used in a sophisticated way. If so, and if cost efficiency is an important consideration, then savings may need to be looked for in delivery.

B. The costs of e-delivery

Although the development costs of even relatively simple online materials may be higher than paper-based print, it seems fairly clear that there are considerable institutional savings on delivery costs. The Library of Virginia has digitized the state's colonial records. This has drastically reduced the costs of fulfilling requests from readers. The costs to the library of providing a single copy of a four page report in digital format is just 90 US cents, compared with \$19 to supply a surface-mail customer, and \$12 to supply an on-site user (Roderick, 1998). Applied to course materials, online delivery to order could cut inventory, packing, and postage costs enormously.

Online library services like those offered or under development by XanEdu and Questia are likely to be invaluable - provided the subscription rates that users are to be charged are not unreasonably high. However, students used to their course materials dropping through their letterboxes are likely to see their study costs rise as they access and perhaps pay for materials online, and print them off themselves.

What about the costs of computer-mediated communications and assessment? Here we get into the costs of labor and the problems of student load. Bates has suggested that in comparison with face-to-face teaching, CMC will lower the costs of tuition because a good deal of the students' time is spent studying the material, and so the teacher needs to spend less time per student overall in class (Bates, 2000: 126-7). Other analysts argue that students will also spend a great deal more time learning from their peers, and that this too will reduce the demands they make of their tutors. Certainly DiBiase (2000: 15-16), teaching for Penn State University's World Campus, found that he and his Teaching Assistant were spending less time supporting students on an online course (1.6 hours per student against 2.6 hours on a regular course).

However, the general consensus seems to be that online tutoring adds to traditional faculty workload (Arizona Learning Systems, 1998: 30) given the enormous volume of messaging (Moonen, 1997) arising from increased interaction with students (Jewitt, 1999: 37), with each message requiring more time to compose than is the case in verbal interactions (Inglis, 1999: 223). For faculty, teaching online opens up the possibility that they are always in session - which translates into 'taking more time' (Schifter, 2000). Moonen (1997) thinks that the increased load would be of the order of 5 to 10 hours a week for a class of 60 to 120 students. Jewett (1999: 41) thinks tutors

could well spend twice as much time tutoring online as they do face-to-face. This raises the question of how many students an online instructor can handle. In classroom courses in the USA it looks as if people think they can handle from 25 to 30 students, working perhaps 10 to 12 hours a week. Boettcher (1999b) suggests that experience indicates that a member of faculty can handle more students on a web course - in the range 25 to 65, but that this will require more time - so that although there are courses with 50-60 students on them, there are many courses where student numbers are deliberately kept down, somewhere in the range of from 12 to 20 students.

One way of coping with an academic's increased workload is to hire more staff but this, of course, costs more. However, the impact on labor costs can be reduced through 'labor-for-labor' substitution - that is, the substitution of cheap labor for expensive faculty labor. This cheap labor might be students (Arvan et al., 1998), teaching assistants, or clerks covering help desks (Arizona Learning Systems, 1998: 24). These options are much discussed in the US literature. However, hiring cheaper labor is not possible in small classes run by just one academic; it only works in large classes (Arvan et al., 1998). Also, labor-for-labor substitution has its critics. Traditionally PhD students have helped teach courses but student labor is not the cheapest labor on offer. Adjunct staff hired by the class is even less expensive - so much so that there is concern that their employment could damage graduate programs by reducing the employment opportunities for PhD students (Turoff, 1997).

Up to now I have been talking about the impact of CMC on the costs of traditional institutions. What about its impact on the costs of distance education delivery? Firstly, there is evidence that distance tutors spend more time moderating and tutoring e-courses. Tolley, drawing on her experience as a UK Open University tutor, found that she spent more than twice as many hours tutoring the online version of *What is Europe?* as she did the 'traditional' version - 120 hours against 48 (Tolley, 2000: 263). She was not paid for the additional work, which also had a dramatic effect on her 'phone bill. Annand, from his perspective at Athabasca University, suggests that it is these costs that may in the end constrain the extent to which large-scale distance teaching universities can adopt online technologies (Annand, 1999: 20). Some institutions are trying to find ways of containing demands on tutor time by controlling student expectations and limiting the time for engagement on a particular topic; others, like the e-University, might subcontract tutoring to commercial ventures like Tutor.com, which will charge students for the service (PricewaterhouseCoopers, 2000, paragraphs 79-80).

Secondly, there are the costs of reception. Cost analysis tends to be bounded by the institutional budget. The costs students incur in acquiring and operating equipment is not generally taken into account - yet from the would-be student's point of view, these costs can have a major impact on affordability, and hence on access. In the USA the distribution of computers is highly graduated by income, race/ethnicity, and educational attainment (Gladieux and Swail, 1999). In the Third World, the situation is much worse. If owning the equipment is a necessary condition for participation, then expect to see more disadvantaged people being excluded on cost grounds.

Local centers may, of course, mitigate student costs by providing access to machines, but they cost a fair amount in rent, equipment, furniture and staffing to set up - and generally accommodate very few students at any one time. This is not a solution to mass access - which is why the African Virtual University is such a limited project. Internet cafés cost money to use and are not necessarily ideal environments for study. In any case, in a country like Uganda, anything that uses a telephone line is extremely expensive.

The assumption behind many of the cases put forward to support the development of e-teaching is that the technology will substitute for the labor costs of teaching. Students will, it is assumed, spend a lot more of their time studying independently from the materials, and much less time in formal classes. One potential advantage is that this will make more faculty time available for students to discuss with their teachers what they have learnt independently (Massy and Zemsky, 1995) - but if so, any savings in faculty time disappear and are likely to be at most modest (Arvan, 1997). If there are no savings on faculty time, then the argument begins to focus on balancing the additional technology costs against sometimes more tenuous accommodation savings - which is not to say that some projects such as the Florida Gulf Coast University do not hope to make substantial savings on building costs. In any case, as Massy and Zemsky (1995) comment, actually achieving capital for labor substitutions may prove difficult for many colleges.

One other factor is the extent to which faculty are properly reimbursed for the costs they incur when teaching online. Schifter (2000) reports the very wide range of practice that occurs. Her analysis suggests that many distance teachers do not have their costs reimbursed.

Generally speaking, there are powerful incentives to bring the costs of teaching down. In a situation where the technology, far from reducing contact hours, may be actually increasing faculty hours spent in contact with students, there are powerful pressures to reduce faculty labor costs by substituting cheaper for more expensive labor. This does not always replace experienced by inexperienced staff; some systems go out of their way to hire recently retired faculty who are looking to supplement their incomes. Nevertheless, the fact remains that the pressure is on to reduce costs. Mass education distance teaching universities such as Britain's Open University, with some courses having over 10,000 students enrolled at the same time, have had to employ models based on a division of labor between those who develop the course materials, those who teach/tutor, and those who mark examination scripts. Not surprisingly the Open University employs its tutors and script markers on contracts of service. Institutions that restrict the number of students taking distance courses do not have the same problem. Certainly with the exception of a few institutions such as the non-traditional University of Phoenix, practice in America has generally not led to any systematic restructuring of academic labor force (Berg, 2000).

Nevertheless, a general increase in the use of adjunct and part-time faculty has been noted (Finkelstein, Seal and Schuster, 1998), while the pressures to massify and reduce costs must give managers an incentive to hire casual labor.

Another factor at play here is the extent to which costs that used to be met by the teaching institution - or at least were wrapped up in the tuition fees charged - are now being pushed on to students quite overtly.

C. The costs of e-administration

We know very little about the costs of e-administration, but on the whole this may be the area where savings are most likely to occur. Service costs in a range of industries are being brought down as institutions invert traditional processes, such as student services, to focus more on Web-based, self-service models (Oblinger, 2001: 17). A paper-based order costs about \$65 to fulfill - but it only costs around \$5 to fulfill an online order (Naughton, 2000: 23). A paper-based invoice may cost US\$0.90 to produce and distribute; online services can reduce this to something like \$0.40 - \$0.60 (Farmer, 1999), and speed the whole process up. Perhaps 75% to 90% of transactions currently done manually and on paper should be done electronically (Oblinger, 2001: 17). This trend will impact on all educational institutions.

E-commerce practices are also invading education to provide income streams. Many US campuses are now allowing advertising on their web sites - with the income from advertising offsetting the cost of the site (Oblinger, 2001: 15). Some universities - such as Georgetown University - have auctioned spare course capacity on the Internet, with bidders hoping, of course, to get a place on an expensive course at a discount (ibid: 15). We can expect eduCommerce to proliferate (ibid.: 15). Certainly the e-University Business Model assumes that this kind of activity will occur (PricewaterhouseCoopers, 2000, paragraphs 194-5).

Nevertheless, entering the e-commerce market has its costs. A Gartner Group report suggests that e-commerce web sites are harder than expected to build, with costs of US\$ 1 million on average - and that this cost is likely to increase by 25% per annum over the next 2 years. Of this cost, 79% is labor-related, 11% hardware, and 10% software (Leach and Smallen, 1998). Few cost studies of online learning appear to cost the development of the web site at anything like this level of expenditure. This must be a cost in the development of a virtual university. In mixed mode institutions, only part of these costs would now generally relate to the development of an online learning capability. However, the costs of a web site supporting a sophisticated online administrative function are likely to be high.

In general none of the studies undertaken to date adequately factor in the costs of overheads. Although, the costs of putting in equipment directly associated with the projects (e.g., servers) are usually taken into account, as are the costs of software licenses, college operating budgets do not usually reflect the full costs of maintaining networked services (Leach and Smallen, 2000). This is something that the US COSTS project is tackling (Leach and Smallen, 2000; Ritschard and Spenser, 1999). The annualisation of equipment also causes problems. Most of the cost studies annualize equipment over five years (Whalen and Wright, 1998; Arizona Learning Systems, 1998), but in the US in 1998/99 the typical replacement cycle for computers was 3 to 5 years; for central servers 3 to 4 years; and for network electronics, 5 to 6 years (Ritschard and Spenser, 1999). This may seem

insignificant - but it impacts on costs significantly, and even more so when the opportunity cost of capital is taken into account. Replacement costs, which tend to rise, are often under-estimated: Ritschard and Spencer (1999) argue that the theoretical replacement cost is the average cost per machine times the number of machines to be replaced. They suggest that annual provision for replacement of computers needs to run at 61% of the theoretical replacement cost. Provision for upgrades of equipment that will not be replaced like-for-like requires an additional 8% of the theoretical budget. Another 6% needs to be set aside for unplanned replacements and unforeseen contingencies; a further 20% budgeted for new staff positions; and another 5% for 'out-of-cycle' changes and upgrades.

Finally, higher-level management costs, including planning and evaluation, are rarely taken into account. Overhead management time is often hard to identify. Much depends on the context- the time spent agreeing that a group of enthusiasts can develop a project will be very different to that required to change an institution's direction. Indeed, developing an IT strategy is likely to be expensive (Bates, 2000; Ravet and Layte, 1997).

These omissions are not always obvious from the cost studies. As this section of the paper makes clear, there are both significant costs involved, and the potential for significant savings in administration. The fact that overhead costs and savings are not built into comparative studies of the costs of online, traditional, and other forms of distance education, must mean that any conclusions drawn from such comparative studies have to be treated with care.

Comparing the costs of e-education with other forms of education

Having looked at the costs involved in online education, let us look at how the costs of e-education courses compare firstly with those of class-based education, and secondly with other forms of distance education.

A. Comparing e-education costs with the costs of face-to-face education

Whether one system is more or less expensive than another will depend upon a range of factors such as those I discussed earlier. One approach is to substitute CMC for face-to-face tuition - leaving everything else unchanged. A study conducted at the University of Illinois found that unit costs came down on all nine courses in which asynchronous learning networks were substituted for face-to-face instruction (Arvan et al., 1998). Bates (2000: 126-7) also thinks that online university courses using just CMC, and involving no real e-materials development, will be cheaper than face-to-face courses. However, most online courses involve some materials, so that cost-efficiency depends on the number of students enrolled. Bates suggests that a standard Web-based course, with a mix of pre-prepared Web materials, online discussion forums, and print in the form of required texts, is increasingly more cost-effective than face-to-face teaching as numbers per class increase beyond 40 per year over a four-year period. Under 20 students, it is not economically worth doing. Between 20 and 40 students per year per course, any cost differences are likely to be less significant than differences in benefits (ibid: 128-9).

If we widen the argument to take into account training costs that fall on employers, then we find that there are stronger reasons to believe in savings. There is general agreement that online training courses are less expensive than face-to-face ones provided the development costs are spread across sufficient numbers of students (possibly over several years), and provided that one takes into account both savings on travel and accommodation costs, and the fact that less of an employee's productive time is lost (employees now train in their own time rather than in the firm's time) (Phelps et al., 1991: 142-3; Inglis, 1999: 12-14; Whalen and Wright, 1998: 40).

However, things do not look so good once purpose-built materials are added in: Bates (2000: 128) says that if as well as having CMC, one also develops purpose-built materials, then the unit costs will be more expensive than face-to-face tuition. Arizona Learning Systems (1998: 24) found that the cost per course enrollment of an 'average' Internet course (US\$571) is higher than that of traditional classroom instruction (\$474), though labor-for-labor substitution might bring this down to \$447. However, much depends on the nature of the materials and their associated development costs which, as we saw, they estimated to vary from US\$6000 to \$1,000,000 for a three unit Internet course (ibid: 13-14).

B. Comparing e-education costs with the costs of other forms of distance education

What about the cost comparison with other forms of distance education? We have very few studies go on. In an Australian study, Inglis found the online version of a course was less cost efficient at all levels of enrolment than a print-based distance education course (Inglis, 1999: 233) (Table 2).

Table 2: *Average cost per student of print and online versions of a course*

Volume of students	Average cost per student: 1999 Aus \$	
	Print version	Online
50	169.84	217.71
100	125.38	171.63
150	110.56	156.27
200	103.15	148.59

Source: Inglis (1999: 231)

Elsewhere, Jung compared the costs of presenting standard three credit courses at the Korea National Open University. The course involving textbooks, CD-ROM and electronic tuition was more expensive than the courses using textbooks, radio and face-to-face tuition, or those using textbooks, television and face-to-face tuition. However, dropout was only 10% on the e-course, compared with 60% on the other two types (Jung, 2000: 228-9) (Table 3).

Table 3: *Data of three types of course offer*

	TV-based course	Radio-based course	Web-based course
Rating	16 week, 3 credit	16 week, 3 credit	16 week, 3 credit
Media	Textbook, TV programs and face-to-face tuition	Textbook, radio programs and face-to-face tuition	Textbook, video- and audio-clips, electronic tuition
Number of students	1000	1000	30
Cost to produce and deliver US\$	80000	35000	13000
Cost per student US\$	80	35	434
Dropout rate (%)	60	60	10
Cost per completed student US\$	200	87.5	482

Overall, then, these studies suggest that e-education is pushing the costs of distance education up. Some of these additional costs are being passed onto the students, but not all of them. And while no doubt the costs of the technology will come down, the fact remains that those who are not able to afford e-education are being written out of the game. This is true within developed countries, at least in respect of some sectors of the population, but much more widely the case in developing countries (Perraton, 2000: 150).

What output is being costed?

The output measures used in cost studies vary from study to study. Some studies are based on the cost per student and/or the cost per graduate, but while this may be a suitable measure of output on which to make cost comparisons between educational systems and institutions, for most purposes a better measure is the cost per student per course. Courses are not, however, standard entities - and hence many studies seek to qualify this measure by defining the kind of course that is being costed in terms of a 'standard' course measured in credit points or credit hours.

Unfortunately this also has its problems because internationally the credit weighting of a course may relate to different things:

- (a) the total expected number of hours that the average student will spend studying the course. This measure applies in the UK, for example, where there is an assumption that a standard three year Bachelor's degree will require 120 credit points of study per year, with each credit point being equivalent to something like 10 hours study.
- (b) the total timetabled weekly contact hours - which is the system found in the USA - and which of course does not reflect the actual hours study put in by students.

Distance education courses by definition do away with or at least sharply reduce the amount of contact between teachers and students, replacing this with independent study. The latter may be based upon reading, listening to, watching, or otherwise engaging with learning materials; doing assignments and tests; or general reflection. This means that the actual time spent studying the materials may have little relation with the total study time theoretically assigned to the course. For example, Hülsmann (2000: 42) found that the faculty who developed a British Open University course on mathematical modeling estimated that the course would require some 448 hours study over the year - but that the actual time spent studying the various mediated elements of the course (text, CD-ROM, video) was estimated to be 336 hours - so that the course study hours were 1.5 times the media study hours. On the other hand, a course for teachers and social workers offered by NKS Norway required 700 hours study, but only 106 hours of this study arose from the studying the print and video materials provided. Here course hours were 6.8 times the media study hours. These differences leads Hülsmann (2000: 17) to suggest that the most appropriate approach to costing media is separately to divide the cost of developing and delivering a given medium by the number of student study hours the medium gives rise to. Thus, for example, a 50 page text that cost £17,500 to develop and that takes an estimated (and average) 5 hours to study has a development cost per student study hour of £350, while a one-hour audiotope that cost £1700 to develop, and takes one hour to study, has a cost per student study hour of £1700. Although there is an element of subjectivity in estimating how long an (average) student will spend studying a particular element of course material, this does give an easy guide to the relative costs of different media. In practice, however, there is a range of factors that impinge on the costs of developing and delivering media - not least questions related to the quality of the materials and the organizational structure and labor market conditions that underpin its development/delivery - and these differences are almost certainly behind the range of costs per student study hour that Hülsmann (2000: 145) found in practice across the 11 courses that he studied. Having said that, the approach enabled him to show the rough order of costs involved, and to establish beyond reasonable doubt that Internet-based text is more expensive than printed text (by a factor of 2), with the cheaper media being print and audio. Certainly Hülsmann's approach to the measurement of outputs has a great deal to commend it.

Conclusions

This paper has sought to do two things: firstly, to review the current approaches to costing e-education and to suggest how this might be best approached, having regard to the issues that have been identified, and in the light of the methodological considerations identified, to look at some of the current range of cost comparisons available. Hopefully it will stimulate others to undertake more cost studies - if only to ensure that we know the costs of the direction upon which we now seem to be embarked.

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Appendices

Appendix 1: Developing e-materials

Expenditure descriptor	Expenditure category	Comments
Materials	General comment	<i>Internet courses may involve a range of media ranging from a brief course outline linked to existing textbooks; texts (content) online; texts + reference materials; images; audio; video; simulations; and virtual reality (Arizona Learning Systems, 1998; Hülsmann, 2000). Media choice has a considerable impact on development and production costs.</i> Materials are usually developed to last several years, so there is an argument for annualizing their costs over the life of the course. Most materials relate to the subject being studied. However, some are of a more administrative nature – information on rules and regulations relating to the course, information on examination arrangements, etc. Such materials properly constitute a cost of a particular given course. Yet other materials may be sent to all the students registered on a group of courses – in which case the cost of these materials would need to be apportioned across the courses (or course enrolments). Not all materials need be supplied direct by the institution. In some cases students will be asked to buy commercially available textbooks, videos, software, etc. These costs are properly a cost of the course – but incurred by the student. Any full-costs study would need to recognize such costs.
Staffing		
Cost of staff time spent on developing materials	Human Resources	<i>The actual amount of time involved in developing courseware varies significantly depending on media (Sparkes, 1984)</i> How jobs are packaged varies considerably. Many large-scale distance teaching institutions divide the labor between those who develop materials, those who teach, and those who mark examinations. Development roles may also be distinct, with divisions between, for example instructional design, content development, content editing, graphic design, etc. Some systems use core staff on full-time salaries with benefits; others use consultants paid by output. In dual mode systems, the preparation of online materials may be regarded as an extra duty, attracting additional payments/compensation (overload pay). Or staff may be relieved of other duties (release time) This may well represent an additional cost to the employer if this time has to be replaced. On this see Schifter, 2000.
- instructional design		
- content development		
- text authoring		
- software development		
- multimedia design and production		
- course specific software development		
- content integration and testing		
- post-test modification costs		
- training		
Staff equipment	Equipment	Some systems may purchase computers and software to enable staff to develop courses; others expect staff (particularly consultants) to provide their own (Schifter, 2000).
Staff expenses arising during development of materials	Expenses	The extent to which development staff have their ISP costs met varies (Schifter, 2000).

Copyright clearance	Expenses	Third party copyright can be a significant expense – so much so that some systems may decide not to use any third party material at all (Moran, 1996)
Materials production		
Production costs - text production - audio production - video production - graphics production - software production	Staff costs, Stocks, Supplies, Consumables	e.g. costs of producing a CD-ROM for delivery to each student on a course
Materials – annual revision (maintenance function)		
	Staff costs Expenses	As for original production costs. The degree of remake may vary, but some revisions – for example, the development of new assignment and examination questions, may be a regular feature of course maintenance.
Developmental testing of course	Staff costs Expenses	Payments to course testers; general running costs of developmental testing

Appendix 2: E-delivery Costs

Expenditure descriptor	Expenditure category	Comments
Materials delivery		
Distribution of courseware (e.g. CD-ROMs, user manual, electronic materials, etc) to students	Expense	Postage, courier, etc costs arising from the distribution of physical goods. On-line delivery costs of 'ethereal' goods.
Materials reception expenses		
Any expenses incurred by those receiving the materials	Expense	This might include incidental costs of reception, costs of purchasing materials, etc.
Student/tutor equipment		
Network/computers/printer	Equipment (capital)	Few institutions now provide students with computers and most analysts (e.g. Hülsmann, 2000) assume that students will provide their own equipment (though tutors may be given help – see Schifter, 2000). Institutionally this is a non-cost, but it remains a 'full-system' cost and should be taken into account for comparative costing purposes. Student and tutor equipment needs to be annualized (perhaps over 5 years, though this may be optimistic) (Leach and Smallen, 1998) Some systems require non-core staff to provide their own equipment (see assumptions built into Turoff, 1997)
	Software (capital)	The initial cost of common software is bundled in with machine purchase – but 'specialist' software may need to be purchased. This is a capital cost but it would be unwise to assume that the software will last as long as the computer. Students may well need to budget to upgrade software.

Student/tutor expenses	Expense	Includes any payments to an ISP and/or connection charges for time online; also needs to cover increased energy costs. Tutors may have their ISP costs refunded (Schifter, 2000) Insurance costs (for equipment) Equipment repair costs
Opportunity costs		
Cost of student time	Opportunity cost for all students, but staff cost for firms	This is a real opportunity cost to employers, and also to the self-employed, who could be doing productive work rather than spending time in training. There is an argument in any cost comparison exercise for placing a value on every student's time (c.f. Whalen and Wright, 1999). It has been suggested that online courses compress the time required to undertake training,
Tuition		
Tuition	Staff Expenses	Payment for teaching students online varies. In some systems permanent full-time staff may do the teaching; in other cases staff may be hired by the hour to teach online. Casual labor and labor substitution is commonplace. There is a debate as to whether online teaching takes more or less time (see article). In a dual mode system, teaching online may be regarded as part of normal duties; or it may be regarded as an additional (new) duty which releases staff from other teaching duties (release time) (Schifter, 2000) or it may be regarded as an additional duty for which staff are paid overtime (overload pay) (ibid). Institutions may restrict enrolments on online course in order to contain the impact of online teaching on staff time (which has implications for costing exercises looking at the impact on costs of expansion).
Student/Tutor Helpdesk		
Staffing	Staff costs	Leach and Smallen (2000) estimate that staffing the typical Helpdesk represents between 7-12% of the total central IT staff. Call centers may well have less expensive front-line staff to handle routine queries, together with a referral system to faculty where this is necessary.
Call costs	Expenses	Some help desks provide students with toll free access.

Appendix 3: Overhead and Infrastructure Costs

Expenditure descriptor	Expenditure category	Comments
High level decision making to embark on online learning		
Decision-making	Staff	Overhead management time – often difficult to identify. Much depends on the context and whether the activity is marginal or central to management concerns. Development of an IT strategy requires considerable time and effort (Bates, 2000; Ritchard and Spenser, 1999).
Expenses related to high level decision-making	Expenses/consumables	E.g. costs of study tour to existing virtual universities; costs of consultants brought in to advise. These costs are difficult to trace where the decision is marginal to the ongoing

		concerns of an institution, but easier to trace if one is setting up a new institution or department.
Institutional evaluation/ quality assurance		
Expenses	Staff cost Expenses/ consumables	E.g. survey costs, report production and dissemination costs, etc.
Web-site development costs		
Overall web site costs	General comment	Likely to be expensive (Farmer, 1999)
Web site development staffing costs (e.g.) - Internet specialists - Graphics/Internet designer	Staff cost	As suggested in (Farmer, 1999) staff costs put into web site development can be significant.
Staff computers purchase Software purchase	Capital	Annualize: most commentators use a 5 year life but this may be optimistic. Typical replacement cycles in US colleges are between 3 and 5 years (Leach and Smallen, 1998). Software may well have an even shorter life.
Staff computers repair	Expense	
Web site implementation		
General comment	All cost categories	Generally the full costs of networked services are not as yet reflected in the annual operating budgets of organizations, nor are the costs of maintaining services
Domain name registration	Expense	
Learning Platform Software License Fees, and Upgrade costs	Capital Expense	Initial cost Annual update at 10% (Whalen and Wright, 1999). Wide variation in the cost of licenses from Canadian \$3000-175,000 (ibid).
Network server	Equipment	Annualize over lifetime. Many commentators suggest a 5 year life but the typical replacement cycle is between 3 and 5 years (Leach and Smallen, 1998). Actual system cost studies suggest wide variation in costs allowed for this.
Network costs – access to Internet	Expense	
Buildings and accommodation (main offices etc.)		
A range of costs involved here including: Purchase of land Construction of a new building Purchase of an existing building Refurbishment cost of an existing building Rental of office accommodation	Capital or expense	Capital costs need to be annualized. The actual construction cost of a building may be known (but if in the past, should be brought up to present day values), or may be estimated (using the average building cost per square meter/foot for that type of building). The life-time of buildings is debatable but probably ranges from 5-10 years (temporary buildings) to 50 (permanent buildings). Smaller projects utilizing a few rooms within an organization might be charged a proportion of the total building costs, based on floor space as a proportion of all space. Alternatively a shadow rental cost could be used, based on commercial rents payable in the area.

Generally space costs are driven by the number of staff working from an office complex, together with space for consultants' workstations; home-based workers will use their own space and in that sense not be part of the space calculation. However, any comparative study should put a cost on home office space.

Buildings and accommodation: running costs including rates (i.e. tax levied on the occupation or ownership of land); buildings and contents insurance; utilities (heat, light, water, power, waste disposal); telephone, fax, etc (rental and usage); repairs and maintenance (direct labour plus materials, or outside contractor charges plus management and supervision costs); grounds and gardens; porters; security; cleaning; management and supervision of all these activities.	Stocks, Supplies, Consumables and Expenses	These items are either treated as a general overhead expense, or they are charged to particular departments and treated as a departmental expense. Where they are treated as a general overhead expense, some proxy measure may be used to allocate these costs out to departments (e.g. floor space measures, staffing levels) In systems where online learning is only part of the activity some kind of measure will need to be used to allocate a proportion of the general expenses to the online operation.
Intranet cost (main offices) Start-up capital costs (new PCs, network connections for PCs not currently networked, servers and server software, and software applications whether developed in-house or purchased)	Capital	An intranet may exist but if not capital equipment costs will be incurred establishing it. Capital costs will need to be annualized. Leach and Smallen (2000) found the typical annualization period to be 5 to 6 years. However, some of the equipment will be subject to annual upgrading, repair, etc. Software applications are likely to have a shorter life and require upgrading more regularly.
Start-up costs (e.g. design consultancy costs, costs of in-house designers and technical support staff, training costs)	Revenue expenses and staff costs	
On-going revenue costs (e.g. editorial and design staff, technical personnel, etc., on-going consultancy, promotion, training, maintenance of bespoke applications)	Revenue staffing costs and expenses	
Furniture (main offices)		
Furniture	Capital	Distinguish between the cost of dedicated staff workstations (linked to staff numbers) and the costs of shared workstations/ common furniture – spread across staff.
Local center/ training center		
Accommodation	Expense (conceivably a capital cost)	Systems that provide tele-learning centers will incur accommodation costs – with the accommodation usually rented, though purchase is a possibility. There will also be the associated running and maintenance costs of each center in the system.

Equipment and furnishing	Capital cost (equipment and furniture)	A telecenter will need desks, chairs, storage cupboards, shelving (for a small library) as well as equipment (server, several PCs, printer(s), fax, photocopier, telephone, etc.) – together with the associated wiring.
Staffing	Staff cost	Technical and security staff
Consumables and expenses	Consumables and expenses	
Equipment replacement	Capital (funded from revenue)	Simple depreciation does not allow sufficient money for replacement of equipment.
Insurance of equipment	Expense	
Digitized courseware/ general library – development and running costs		See Roderick, 1998, for a case study
Equipment – initial purchase and replacement	Capital	e.g. computer, scanner, software. Costs need to be annualized.
Maintenance of equipment	Expense	
Technical staff to create and maintain record – document scanning, indexation, etc., and to maintain system/equipment	Staff costs	Salary and on-costs (benefits)
Marketing costs		
Marketing staff	Staff costs	Salary and on-costs (benefits)
Non-staff costs	Expenses/ consumables	
Shared central costs		
E.g. costs of personnel, purchasing, financial management, accounting, and audit, etc.	All revenue cost types	In dual mode systems, a proportion of these overhead costs would need to be apportioned to the networked learning 'enterprise', and the rest to other business objectives.

UNIT 5:

A SYSTEM-LEVEL COMPARISON OF COST-EFFICIENCY AND RETURN ON INVESTMENT RELATED TO ONLINE COURSE DELIVERY

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As the number of students enrolling in Internet-based or online instruction grows, so do questions from educational leaders, policymakers, college and university presidents, members of governing boards, and legislators regarding cost (Johnstone, 2001). This situation is not unique to the United States.

Decision-makers considered the primary benefit of online distance education to be that costs could be spread over a large number of students, taking advantage of economy of scale, assuming that large numbers of students would increase revenue and lower cost-per-student and operating expenses. In addition, increased access and quality learning experiences remained important (Inglis, 1999).

Bates (1995) pointed out that the ‘continuing reduction in the costs of technologies, and their increasing accessibility, is making it easier for organizations to enter directly at the tactical level’ (p. 34). This has resulted in a number of institutions considering distance education for the first time.

This increasing popularity has led to a call by ‘policy-makers to ask whether networked learning is cheaper or more expensive than other approaches to education, and what needs to be taken into account in costing such systems’ (Rumble, 2001, p. 75). Rumble (1989) also found that

the activity of costing is therefore central to the planning and development of educational systems...reports, conferences and workshops often indicate a need for a “simple” costing tool that will help those who wish to develop distance and open learning courses. (p. 2)

Most studies do not address simple questions such as ‘what is the per-credit- hour cost associated with online instruction?’ and ‘how do costs of online delivery methods compare to more traditional, face-to-face classroom instruction?’ Jones (2001) stated, ‘There is not sufficient empirical evidence to yield rules of thumb that can inform managerial choices’ (p. 2).

This study compared costs and revenues of Illinois community colleges related specifically to online delivery systems in order, first, to determine cost-efficiency and second, to compare the results among online courses at selected community colleges in Illinois. The research question to be answered was “To what extent are online courses delivered at community colleges in Illinois cost efficient?”

Although this study concentrates on outcomes experienced by community colleges in Illinois, the methods employed and results should be of interest to any educational institution engaged in or considering the development of online courses and/or programs.

Purpose

A system-level comparison of cost, revenue, and return on investment, constructed using Rumble's (2001) theoretical framework, may provide a basis for the development of a financial model and expenditure estimates for other private and public ventures in this area.

This study compiled existing data, gathered additional information regarding direct and indirect costs supporting online courses, and analyzed the data for comparative purposes. Specifically, median spending related to compensation, operational, capital and course development costs was examined. In addition the numbers of students needed per course to achieve cost-efficiency were examined.

Rumble (2001) suggests that a comprehensive approach to costing networked learning is needed and that in order to compare relative cost-effectiveness of online courses among institutions, a set of delimiting definitions including expenditure by category, contributions, revenue and capital costs, and initial investment is critical.

An instrument (TCM Tabulator) was developed through the Technology Costing Methodology Project in 2001 (Western Interstate Commission for Higher Education, 2001). The TCM project was designed to consider the full range of costs associated with several different alternative as well as traditional course delivery modes. Although this instrument does an excellent job of providing a methodology for determining costs, comparing costs, and identifying benchmarks, some modification was needed to fit the TCM to the constraints of this study.

The TCM Tabulator was designed as an all-purpose instrument, ostensibly usable by any college, university, school, consortium or cluster of institutions. Additionally, the Tabulator identifies costs on a per-course basis rather than the per-credit-hour unit that is specific to Illinois.

In 1998, the chief financial officers of a consortium of five community colleges in Illinois developed a rough, unpublished set of cost variables used to calculate the cost of delivering an online course by considering both direct and indirect costs and reducing them to a per-student-credit-hour figure. This formula was rudimentary and lacked explicit operational definitions of costs found in the TCM Tabulator, but it was particularly geared to the idiosyncrasies of community colleges in Illinois. This formula considered unique factors such as categorical credit-hour reimbursement and equalization grants as well as local and system-wide initiatives designed to support and foster the development of online coursework.

In combining the explicit definitions present in the TCM Tabulator with the customized applicability of the consortium-developed tool, this study employed a customized instrument that builds upon the strengths of the antecedents. The new instrument, referred to as the Cost Identification Worksheet, was designed to meet the following objectives:

1. Consider the full range of costs associated with the delivery of coursework in a computer-mediated environment, using the Internet as the transport medium.
2. Identify and categorize course-level costs from a variety of institutions with similar missions (community colleges) and funding mechanisms, but of disparate size (both enrollment and support services), costing and accounting methods, and administrative structures.
3. Explicitly define and account for direct costs and certain indirect costs in order to ensure the highest levels of reliability when comparing data and determining factors that affect cost-efficiency and return on investment related to online courses.

Limits

When considering costs of a particular educational delivery system, Rumble (1997) outlined three general measures: cost-benefit, cost-efficiency and cost-effectiveness.

Cost-benefit 'seeks to measure in economic terms the benefits of education to the individual and society' in terms of the rate of return to the individual and to society as a whole (Rumble, 1997, p. 181).

According to Rumble (1989), a system is 'cost efficient if, relative to another system, its outputs cost less per unit of input. A system increases its cost-efficiency when it maintains output with a less than proportional increase in inputs' (p. 120).

Cost-effectiveness is a measurement or determination of the extent to which a system 'produces outputs that are relevant to the needs and demands of its clients' (Rumble, 1997, p. 161). Efficiency and effectiveness are not mutually exclusive. Organizations can be efficient while lacking effectiveness and vice-versa.

There is a difference between cost-benefit and cost-effectiveness. A cost-benefit analysis is used when 'both cost and effects can be measured in monetary terms' and cost-effectiveness is applied when 'costs are expressed in monetary terms and effects are measured in non-monetary terms,' according to Moonen (1997, p. 2). In order to accurately compare two systems:

either the cost or the effects...have to be fixed. When the costs are the same...the system with the largest effect is the most efficient. When the effects are the same...the system with the smallest cost is the most efficient. (Moonen, 1997, p. 3)

Moonen advocates a practical solution that, for the purpose of this study, assumes the effects of the two systems are the same, thereby allowing the analysis to focus on costs (1997, p. 3).

Cost and revenue information collected from each college consisted of annual actual expenditures related to online courses and categorized into specific, defined categories.

There are some costs of assets usually required to support online courses that were not recognized in the data collection instrument. These include the cost of e-mail, Web services, Internet access in general and other network-based services. Although these services can have substantial costs associated with acquisition, maintenance, and replacement, the services are used by the entire campus and would most likely be present and useful regardless of the presence of online coursework.

Historical overview

Questions of cost-efficiency, which are central to this study, have been the subject of numerous academic research projects focusing on the relative and educational costs of different media and technology. Many cost-efficiency studies have concluded that the use of videoconferencing incurred substantial cost-savings, even though costs were higher than those of other classroom-based delivery methods (Hosley & Randolph, 1993; Markowitz, 1990; Simonson & Jones, 1993; Showalter, 1983; Trevor-Duetsch & Baker, 1997).

A number of studies have focused on implementations of computer-mediated conferencing (Harasim, 1990; McCreary & Van Duren, 1987; Rumble, 1989). Cuckier (1997) found 'a relatively large literature discussing the costs and benefits of distance education' but that 'most of the available studies have dealt with the cost-effectiveness [efficiency] of distance education as compared with traditional face-to-face teaching' (p. 137).

Cuckier (1997) added that 'there are fewer studies which examine the costs and benefits of particular technologies used in distance education or which determine the appropriateness of various costing models' (p. 137).

One such study of an online course at the University of British Columbia found that the annual break-even enrollment based on projected costs and revenues over 4 years was 44.18 students (Bartolic-Zlomislic & Bates, 1999). The methodology employed in this study detailed cost per student rather than per credit hour, which may adequately explain cost at the university level, but which holds relatively little significance for community colleges where students are more transient and likely to enroll in only a few courses (Office of Institutional Research and Evaluation, 2001).

Several other models offering a framework for evaluating cost-effectiveness and efficiency have been developed by Bates (1995), Cuckier (1997), Jones (2001) and Rumble (2001). These studies vary significantly in methodology, technology, focus and scope, but all identify a common set of cost variables including direct and indirect costs, fixed and variable costs and costs borne by others.

The need for and utility of a costing tool to aid in planning notwithstanding, the 'measurement of the costs seems to be very straightforward, [but] in practice many problems are encountered' (Moonen, 1997, p. 2). Moonen (1997), supported by Bakia (2000), stated that there is disagreement about the kind of costs that should be taken into account as well as the lack of reliable data relative to cost because costs have not been gathered in any reliable way. Additionally, the costs in question are not stable and evolve quickly, which is typical of new communication and information technologies (Bakia, 2000). Similarly, in an analysis of previous studies on cost-efficiency, Capper and Fletcher (1996) identified factors that influenced cost in distance-delivered courses. These factors include number of courses offered, frequency of course revision, type of media employed, type and amount of student support, and rate of attrition. Cost-effectiveness is supported in most studies, but costs varied substantially and were influenced by many factors (Batey & Cowell, 1986; Rumble, 1982).

In general, it is known that 'distance education can be cost effective and that cost-effectiveness [efficiency] is largely dependent upon the number of students served and the fixed costs of development and delivery' (Phelps et al. 1991, p.8).

Early studies on cost-effectiveness and identified factors that influenced cost in distance-delivered courses include the number of courses offered, frequency of course revision, type of media employed, type and amount of student support and rate of attrition, concluding that cost-effectiveness is supported in most studies but costs varied substantially and were influenced by many factors (Capper & Fletcher, 1996).

Methods and procedures

Data were collected related to the number of students enrolling in online courses by institution, course, section, and residency status, all of which were available from the Illinois Virtual Campus. One full semester (Spring 2001) of data was used.

Next, a survey entitled "The Cost Identification Worksheet" was administered to chief financial officers at 34 community colleges in Illinois in order to collect data related to actual, direct, fixed, and variable costs as well as other variables suggested in the literature (Rumble, 2001, p. 76).

A detailed cost calculation procedure was developed to assist chief financial officers in providing accurate and appropriate information. This procedure was largely based upon the TCM methodology and framework and the Illinois Prairie Consortium Cost Variables (Illinois Prairie Internet Consortium, 2002; Western Interstate Commission for Higher Education, 2001).

After data collection was completed, a template for determining per-student, per-credit-hour costs was constructed for each institution as well as a cost of infrastructure, student support, and course/faculty support for comparison purposes.

The cost variable was generated by a simple formula, based on the literature that identified appropriate cost considerations.

The formula was for calculating costs was $C_1 + O + C_2 + D = \text{Expenditures}$.

The cost category C_1 included compensation of management, professional staff, full-time faculty, part-time faculty, clerical, and student/other personnel.

The cost category O included operating expenses such as office/instructional supplies, travel, communications, duplication and printing, postage and distribution, contractual services, licenses, and rent.

The cost category C_2 consisted of capital items defined as equipment that had a useful life greater than one year, had an acquisition cost greater than \$1,000, and was owned by the college.

The cost category D consisted of development costs usually paid to faculty for developing an online course.

Similarly, a second variable considers revenue and is expressed as $ID * ID \text{ rate} + OD * OD \text{ rate} + (OS * OS \text{ rate}) + (OC * OC \text{ rate}) + F + B + G = \text{Revenue}$.

The revenue categories ID, OD, OS, and OC represented in-district, out-of- district, out-of-state, and out-of-country tuition rates per student credit hour, respectively.

The revenue category F included fees charged exclusively to students enrolling in online sections, category B included costs borne by others and other revenue, category G included additional revenue acquired via Illinois Community Colleges Online program and/or course development grants.

The dependent variable was cost-efficiency as operationally defined by Rumble (1997). An institution that expended less money than it received, relative to the other colleges participating in the study, was considered cost efficient. A determination of cost-efficiency or inefficiency alone does not provide an adequate means for determining the extent to which an institution or system is cost efficient or inefficient. By calculating profit/loss and return on investment, a measurable illustration of the extent to which an institution was (in)efficient was determined and expressed as a percentage. It provides a standard for 'evaluating how efficiently management employs the average dollar invested in a firm's assets' (Seigel, Shim, & Dauber, 1997, p. 475).

Return on investment was determined by a formula which defined ROI 'as the "return" (incremental gain) from an action divided by the cost of that action' and calculated in the business world by dividing net profit after taxes by total assets (Seigel, Shim, & Dauber, 1997, p. 475).

Return on investment was expressed by dividing net profit by net expenditures and converting the decimal to a percentage.

Only direct costs of instruction and direct costs of associated support activities were used, and only when these costs were identifiable. This study did not attempt to allocate direct costs of support activities (commonly referred to as indirect costs) in order to yield the full cost of instruction. Consequently, this study did not consider indirect costs related to general administration, physical plant, operating and maintenance, security, Internet access, etc. and relate them back to instruction.

Direct costs that were collected through the instrument include assessment services, academic personnel development, advertising and marketing, compensation of management, compensation of professionals, compensation of full-time faculty, compensation of part-time faculty, compensation of clerical personnel, compensation of students/other, office and

instructional supplies, travel, communications, duplication and printing, postage and distribution, contractual services, licenses, rent, equipment, development costs, and other. The Cost Identification Worksheet separated these expenses into three different categories: compensation, operating expenses, and capital items.

The Cost Identification Worksheet captured revenue generated by student enrollment in the form of tuition, accounting for variable rates based on residency, course/delivery fees, state apportionment, and costs borne by others. Equalization grants, small college grants, and other funding mechanisms that attempt to balance income based on median income and similar factors were excluded from the revenue calculation.

Course development grants provided by the State of Illinois through the Illinois Community Colleges Online initiative (ILCCO) were considered a cost borne by others because these grants were designed to directly offset course development costs, a measured expense.

Additionally, the State of Illinois provides each community college with approximately \$14,000 per year to provide support services and computer access to online students. Other grants that support staff technical skills training and support high tech equipment purchases, if used to support online instruction, were included. These examples are all considered as costs borne by others which, should policy change, could have a significant impact on cost calculations.

After data collection was completed, the individual institutional data were summed to determine cost in each expense category as well as summary data corresponding to cost of overhead, instruction, total course development costs, and finally, cost per student credit hour.

Revenues were calculated to determine revenue per student credit hour. An institutional ratio of part-time versus full-time faculty teaching assignments was compiled.

The question of institutional cost-efficiency was answered by simply subtracting total costs from total revenues. If the figure was positive, the institution was deemed to have demonstrated cost-efficiency in congruence with Rumble's definition, which is producing student credit hours at a cost that is less than revenue.

Cost per student credit hour as well as revenue per student credit hour data were used to calculate return on investment (ROI) and were expressed as a percentage.

After all institutional data were calculated, they were compiled into a composite spreadsheet in order to calculate mean cost and revenue per student credit hour. Additional means were calculated that consider the cost of course development, compensation, operating expenses, and cost of capital items, per student credit hour.

Finally, it was anticipated that the percentage of institutions that were cost efficient (or not) would, in conjunction with an average return on investment figure, provide a definitive response to the research question, "To what extent are online courses delivered at community colleges in Illinois cost efficient?"

Thirty-four Cost Identification Worksheets were sent to the chief financial officers of thirty-four community colleges in Illinois. Five community colleges were excluded from the study. Four of the five exclusions were due to the fact that no course data were reported to the Illinois Virtual Campus for the spring semester of 2001. The remaining institution was excluded because it operated on a quarter credit system, which would result in a conversion and equivalency issue when compared with other institutions.

Of the thirty-four worksheets distributed, twelve were returned by the deadline, resulting in a response rate 35%. All returned Cost Identification Worksheets were compiled into an aggregate Excel file for analysis, with each institution assigned a letter/number designation of C1 through C12 to preserve institutional confidentiality. For each cost and revenue category, a mean, median, maximum, minimum, and range between maximum and minimum values was calculated. Those values represented as 0 should be interpreted as no dollars expended or no dollars in revenue rather than a lack of data.

Expenditures

Compensation (C₁). The first category of expenditure consisted of compensation. This category was subdivided to separate instructional (teaching) compensation from all other compensation categories.

Instructional costs were calculated by using the reported median per-credit-hour rates of pay for part-time faculty and median annual salaries of full-time faculty divided by an average annual teaching load of thirty credit hours (Figure 1). Courses were identified as being taught by either full-time or part-time faculty. Total number of credit hours taught by part-time and full-time faculty were calculated and multiplied by the corresponding compensation rate. These values were summed to arrive at the total cost of instruction, as illustrated in Figure 1.

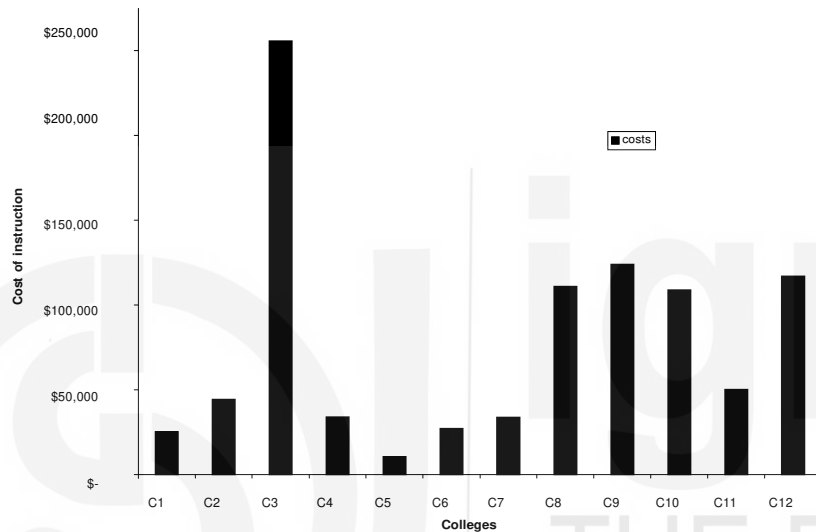


Figure 1: *Instructional costs*

The mean part-time faculty rate was \$470.00 with a standard deviation of \$96.38. Eight colleges were within one standard deviation and four colleges were within two standard deviations from the mean. These results are illustrated in Figure 2.

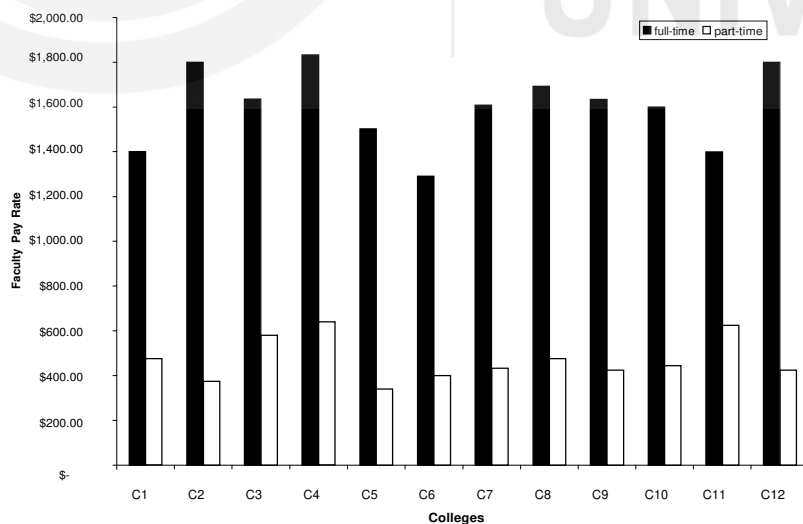


Figure 2: *Median faculty pay rates*

The mean full-time faculty rate was \$1,599.33 with a standard deviation of \$173.47. Six colleges fell within one standard deviation and six colleges were within two standard deviations from the mean.

The distribution of the cost of instruction between full-time faculty and part-time faculty is presented in Figure 3.

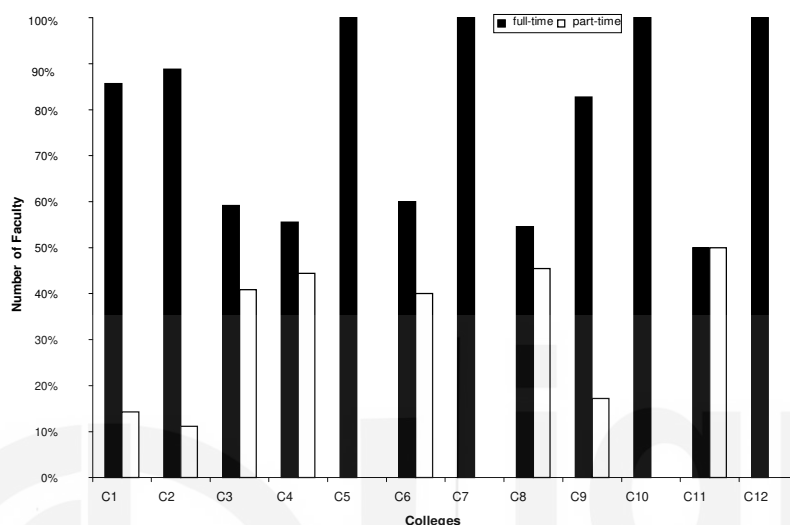


Figure 3: Full-time versus part-time load distribution

The second subdivision of the compensation category included several classifications of individuals employed to support, develop, manage, and/or direct online courses. The first classification was labeled “Executive Managers” and included those persons whose assignments required primary responsibility for management of the unit, department, or service directly related to the development, delivery, and support of online coursework. Examples included Director, Coordinator, Department Chair, Dean, and Associate Vice President. If online delivery systems represented only a portion of assigned responsibilities, respondents were asked to calculate the percentage of the annual salary devoted to online activities.

The second classification was labeled “Other Professionals” and included those persons employed for the primary purpose of performing academic support, student service, and institutional support activities directly supporting online courses. The third classification was labeled “Technicians” and included full-time network specialists, programmers, Webpage developers, graphic artists, and other similar job duties.

The fourth classification was labeled “Clerical Staff” and included those persons whose assignments were typically associated with clerical activities or were specifically of a secretarial nature. The fifth classification was labeled “Student Workers/PT Workers” and included all other hourly or non-full-time staff assigned to support, develop, coordinate, or manage some aspect of online course development, delivery, or support.

The five classifications of compensation, exclusive of instructional costs, were aggregated and expressed in Figure 4.

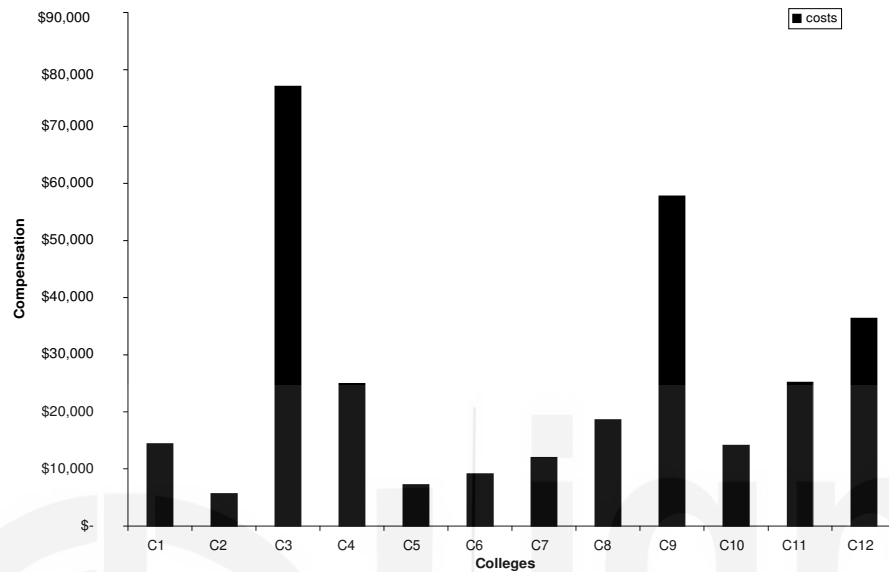


Figure 4: Compensation other than instruction

Operating expenses (O). The second category of expenditure consisted of operating expenses. This category was subdivided into eight categories and includes commodities, travel, communications, duplication of materials, postage/distribution services, contractual services, license/user fees and rent.

The eight categories of operating expenses were aggregated and expressed in Figure 5.

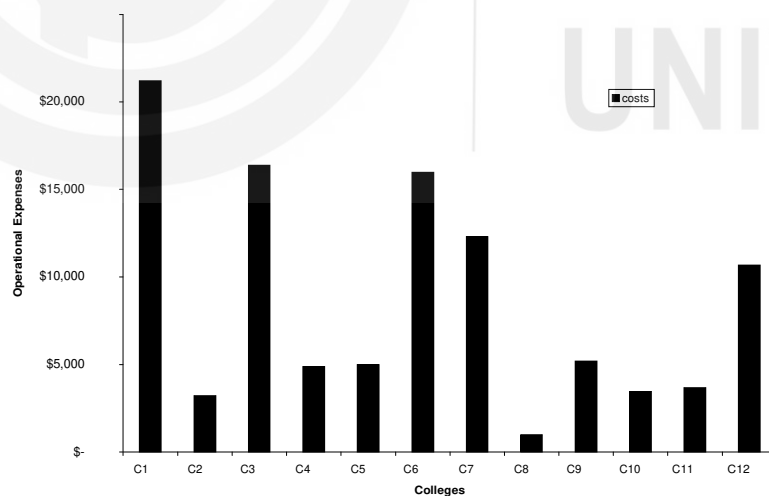


Figure 5: Operating expenses

Capital (C2). The third category of expenditure consisted of capital expenditures. Included in this category were expenditures for items that had a useful life of greater than one year and an acquisition cost of greater than \$1,000.00. Also, capital items must have become the property of the college, excluding items that were rented, leased, or licensed. This category was subdivided into equipment and telecom infrastructure.

Capital expenses were aggregated and expressed in Figure 6.

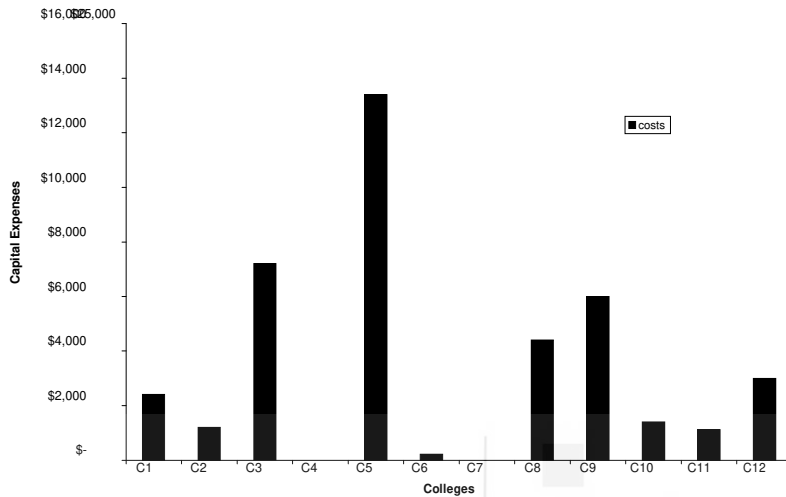


Figure 6: Capital expenses

The fourth category of expenditure consisted of course development costs. Respondents were asked to identify the amount of money paid to the particular faculty member(s) employed to develop the reported online course.

Each course, based on the institutional compensation scheme, was assigned an initial cost. This cost was amortized over a 5-year period (10 offerings), assuming the course was taught once per semester. Figure 7 represents the aggregate course development costs incurred.

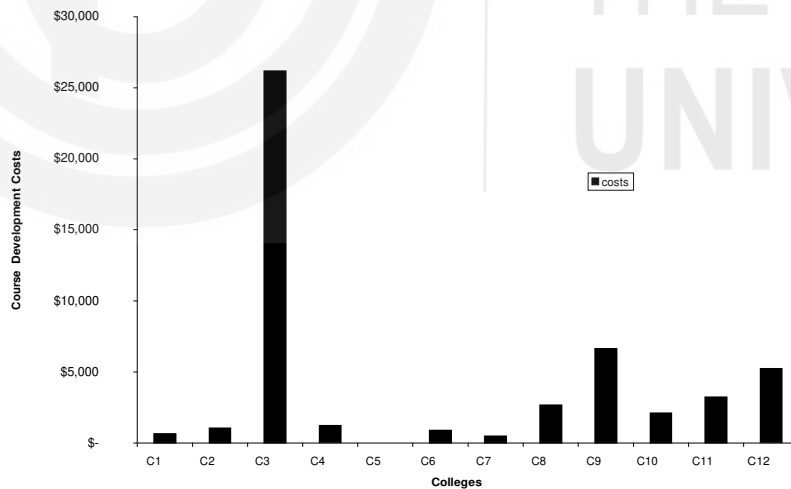


Figure 7: Course development

Each college's course development costs were summed and divided by the total number of course credit hours generated to arrive at a mean cost of course development per credit hour. These results are illustrated in Figure 8.

Readings in Economics of Distance Education

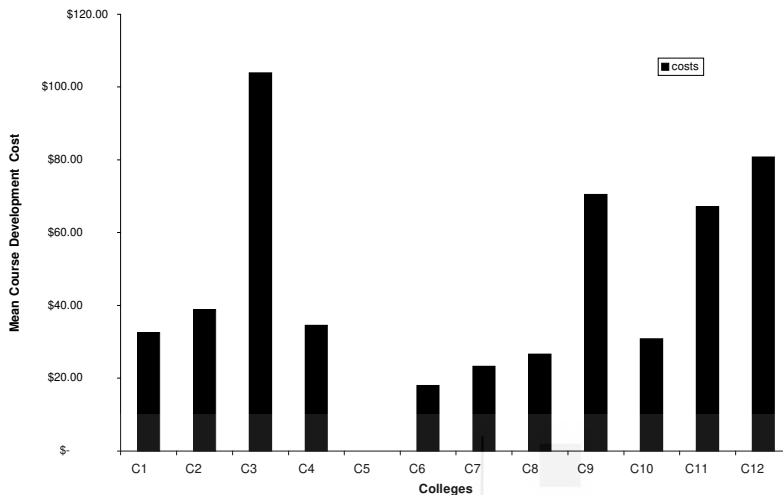


Figure 8: Mean course development cost per credit hour

Finally, all categories of expenditure (compensation, operational, capital, and course development) were summed in order to calculate net expenditures. The formula for calculating net expenditures was described in chapter 3 as $C1+O+C2+D=E$, with E representing net expenditures. These results are represented in Figure 9.

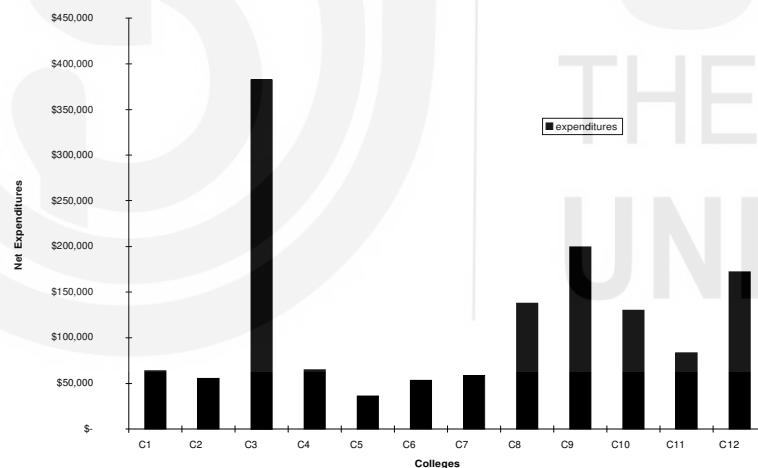


Figure 9: Net expenditures

Revenue

Revenue was identified by multiplying the tuition rate of the four residency classifications (in-district, out-of-district, out-of-state, and out-of-country) by the corresponding number of student credit hours generated in each residency classification. Credit hours generated by in-district and out-of-district students received an additional \$37.00 (averaged figure) per credit hour in state apportionment that the Illinois Community College Board reimbursed colleges in 2001. All other residency classifications were not eligible for state apportionment, hence the higher tuition rates.

Figure 10 illustrates tuition revenue based on residency classification. Tuition revenue was calculated by multiplying the number of credit hours generated in each residency classification by the corresponding tuition rate.

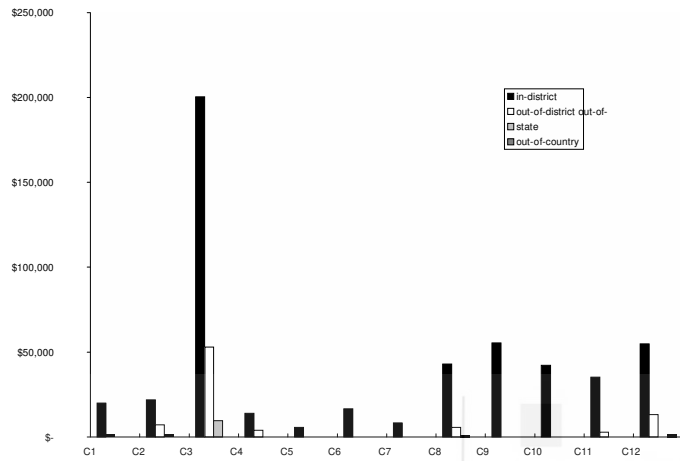


Figure 10: Tuition revenue

Tuition rates by residency classification for each college were collected and are presented in Figure 11.

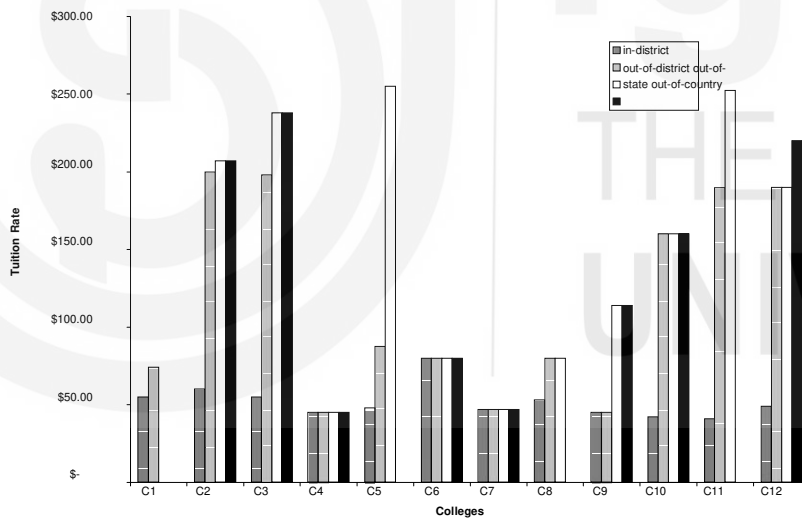


Figure 11: Tuition rates

Six of the twelve responding colleges charged a fee in addition to tuition, calculated on a per-credit-hour basis. Figure 12 identifies the net fee revenue, calculated by multiplying the per-credit-hour fee by the number of student credit hours generated.

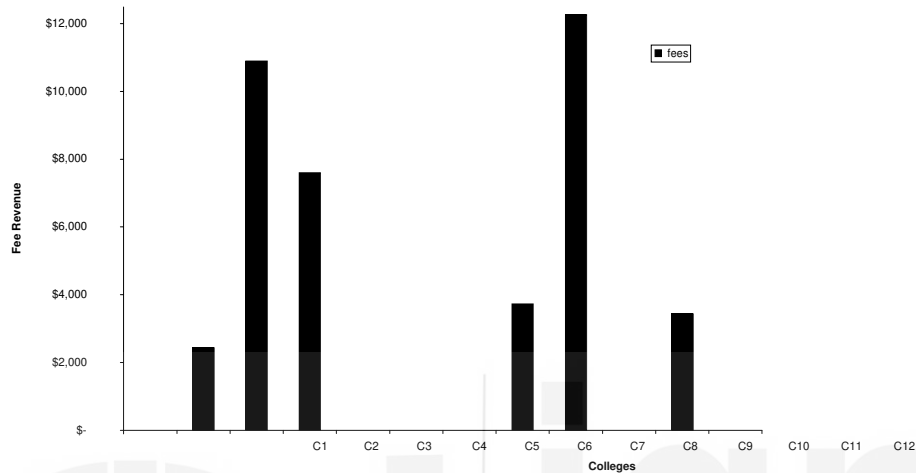


Figure 12: *Fee revenue*

All colleges were granted \$14,100 during the 2001 academic year by the Illinois Community College Board to offset the cost of student support incurred through participation in the Illinois Community Colleges Online initiative. Two colleges received additional grant dollars that were used to support online course delivery and/or support services. Figure 13 illustrates grant revenue, of which only 60% is realized due to a single semester timeframe of study.

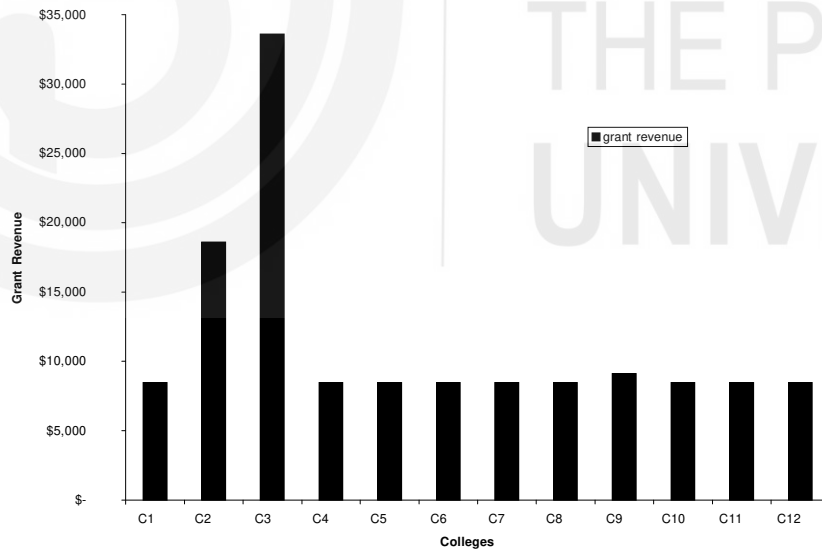


Figure 13: *Grant revenue*

Two colleges received revenue from sources described as Other. This category includes costs borne by others. Figure 14 reflects revenues characterized as Other.

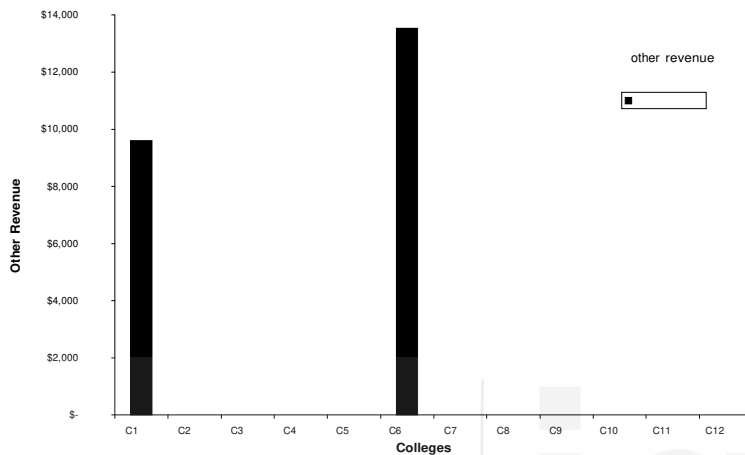


Figure 14: Other revenue

A final calculation, represented as $(ID \times ID \text{ rate}) + (OD \times OD \text{ rate}) + (OS \times OS \text{ rate}) + (OC \times OC \text{ rate}) + F + B + G = \text{Revenue}$, was employed to determine net revenue. The results are represented in Figure 15.

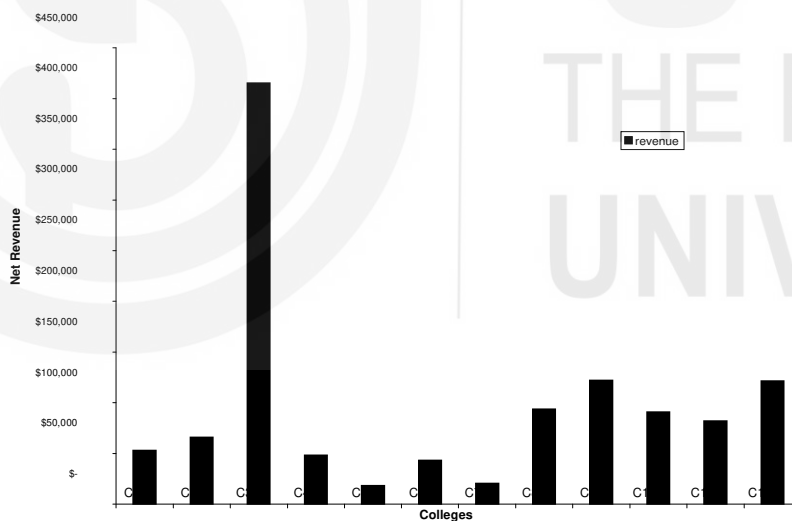


Figure 15: Net revenue

The dependent variable was cost-efficiency as operationally defined by Rumble (1997). A system is 'cost efficient if, relative to another system, its outputs cost less per unit of input' (p. 120). Therefore, an institution that expended less money than it received, relative to the other colleges participating in the study, was considered cost efficient. Figure 16 represents a profit/loss calculation which compared net revenues to net expenditures ($R-E=P/L$).

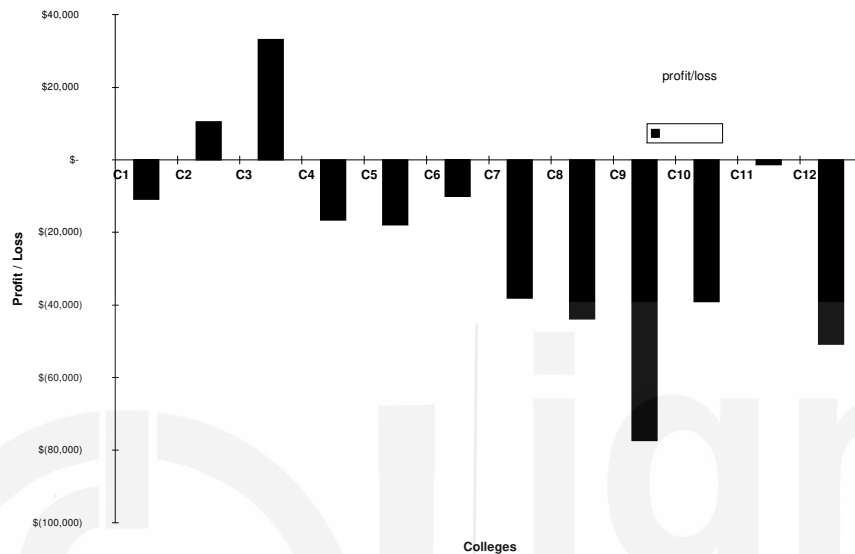


Figure 16: Profit/Loss

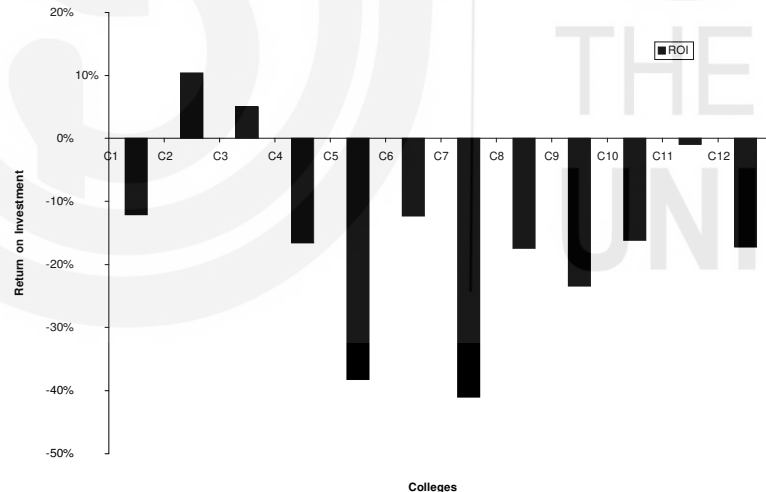


Figure 17: Return on investment

The result of this calculation was used as a basis for determining cost-efficiency. Those colleges that reflect a profit were determined to be cost efficient, and conversely, those colleges reflecting a loss were determined to be cost inefficient.

Two of the twelve colleges participating in the study were determined to be cost efficient. The remaining 10 colleges were cost-inefficient.

A range in profitability of \$14,110.33 was calculated between the two colleges determined to be cost efficient. A range of \$72,941.60 was calculated between the ten colleges determined to be cost inefficient.

The determination of cost per student credit hour was accomplished by dividing net expenditures by the number of student credit hours generated. Revenue per student credit hour was determined by dividing net revenue by the number of student credit hours generated. Figure 18 presents these independent variables.

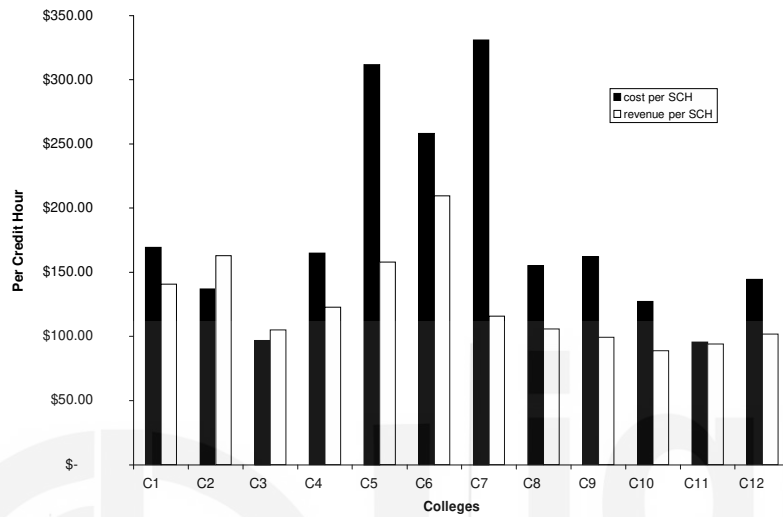


Figure 18: Cost and revenue per student credit hour

Figure 19 illustrates the difference between revenue and cost per student credit hour. Figure 20 represents mean class size.

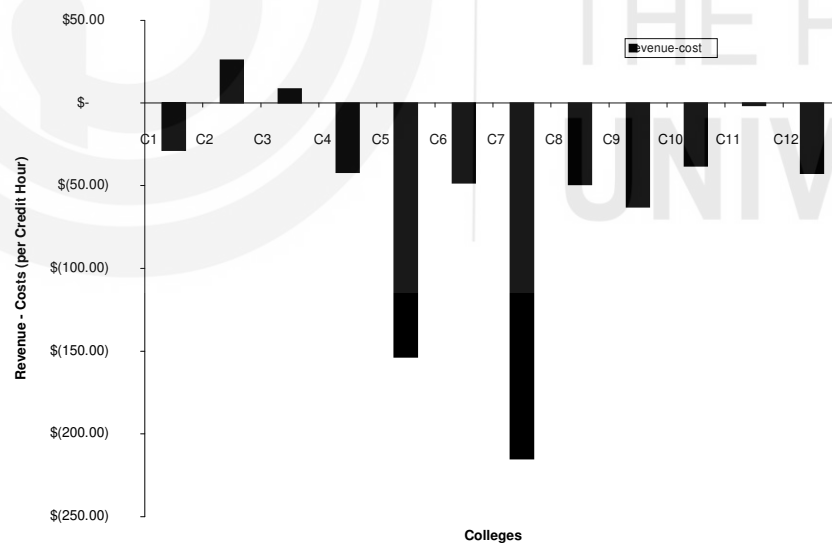


Figure 19: Revenue minus cost (per student credit hour)

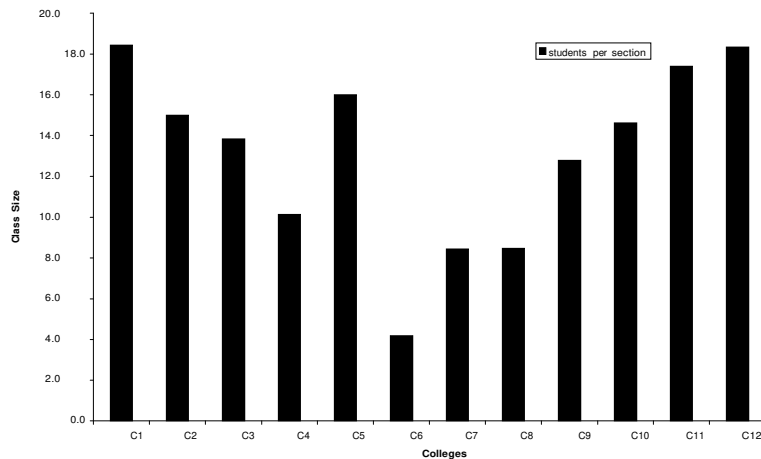


Figure 20: Mean class size

Conclusions

This study found that online programs at 83% of the community colleges participating in the study were *not* cost efficient and did *not* provide a positive return on investment. These findings are *not* consistent with the literature. Cost-effectiveness was supported in most other studies, but it was noted that costs varied substantially and were influenced by many factors (Batey & Cowell, 1986; Rumble, 1982).

Although this study was not designed to compare online courses with their traditional counterparts, it is interesting to note that after piloting the TCM (Technology Costing Methodology) at 17 institutions, Jones determined that technology-mediated instruction was more expensive than face-to-face instruction in all instances (Jones, 2001, p. v).

On the other hand, an issue identified in the literature by Inglis (1999), Kearsley (2000), and Whalen and Wright (1999) was that the reduction of costs appeared to be one of the main factors leading institutions to adopt third-generation distance education technologies. Of the two colleges determined to be cost efficient, the mean return on investment was just 7.7% for a single semester. When considering the ten cost-inefficient colleges, the mean return on investment was -19.5% in a single semester. The perception that third-generation distance education systems will reduce costs is not supported by this study.

Finally, in response to the research question “To what extent are online courses delivered at community colleges in Illinois cost efficient?” the results of this study do not support the premise that online courses are cost-efficient. Two of the 12 responding colleges were determined to be cost efficient. The mean return on investment was -15%.

Expenditures. Net expenditures in support of online programs are, to a large extent, a function of the number of students served. The two colleges that earned a positive return on investment realized an 85.5% difference in net expenditures and an 89.7% difference in the number of students enrolled but reflect only a 4.2% difference in the amount of money spent per student. There is a strong relationship between the number of students served and the overall cost of the program.

Given that 78% of all courses were taught by full-time faculty, cost of instruction was found to be the most significant cost factor.

Compensation other than instruction accounted for 21.2% of the net and operating, capital, and course development costs comprised 11%, 4.6%, and 2.3%, respectively.

In response to the question 'What is the per-credit-hour cost associated with online instruction?' posed by Jones (2001, p. 2), the mean cost per student credit hour was \$179.46. Cost per student credit hour, unsurprisingly, varied almost identically to full-time faculty pay rates, with a \$235.45 range between the maximum and minimum, with four colleges presenting figures that were two standard deviations from the mean.

Decision-makers considered the primary benefit of online distance education to be that costs could be spread over a large number of students, taking advantage of economy of scale, assuming that large numbers of students would increase revenue and lower cost-per-student and operating expenses (Inglis, 1999). In addition, Phelps et al. (1991) stated, 'Distance education can be cost effective and that cost-effectiveness [efficiency] is largely dependent upon the number of students served and the fixed costs of development and delivery' (p. 8). Phelps et al.'s findings were only partially confirmed as the cost of instruction (delivery) and number of students had significant impact on cost-efficiency as cost of instruction is the single largest category of expenditure and student tuition accounted for the single largest revenue category. In opposition, the most cost-inefficient colleges presented the best efficiencies related to class size. College C1 presented a mean of 18 students per section, yet earned a -12.1% return on investment. The two colleges earning a positive return (C2 and C3) presented a mean class size of 15 and 13.8, which was consistent with the median class size of 14.

Jones noted that scale was a significant factor and that larger enrollments would have created conditions in which technology-mediated delivery would be less expensive and that continued effort must be made to identify those conditions (Jones, 2001, p. v). Colleges in Illinois would benefit from this advice. Given that Bartolic-Zlomislic and Bates (1991) found that the annual break-even enrollment in their study, based on projected costs and revenues over four years, was 44.18 students, perhaps the Illinois colleges need to significantly increase class size in order to approach cost-efficiency.

The cost of course development, which was underscored in the literature as one of the major cost categories, was found to be relatively insignificant and accounted for only 6.8% of net expenditures.

Revenue. In comparing the means in revenue categories, it was discovered that 70% of revenue was generated from in-district tuition plus state apportionment. Grants accounted for 18.3% of revenue, and out-of-district tuition and apportionment accounted for an additional 6%.

Revenue per student credit hour was relatively stable among colleges. Only a single college presented revenue per student credit hour that was more than one standard deviation from the mean. Accordingly, in-district tuition rates, the largest revenue producing category, mirrored revenue per credit hour with only a single college more than one standard deviation from the mean. In summary, revenue categories appeared to be relatively stable among colleges due primarily to similar in-district tuition rates. The findings of this study should be especially useful to managers and administrators at each of the colleges that participated, as well as the Illinois Community Colleges Online project. These findings allow decision-makers to determine which categories of expenditure and revenue, when compared with colleges in the same statewide system, are within reasonable proximity. The Cost Identification Worksheet may fill this need, especially in Illinois.

Future cost-efficiency studies will benefit from the use of this and other similar studies in that these definitions are becoming more explicit. It is worth noting that a threat to the statistical conclusion validity lies in the fact that it remains difficult to collect reliable data from multiple institutions at a level of detail needed for accurate comparison, as evidenced by the low response rate. There is no accurate way to error-check the data provided by the responding colleges to ensure that the cost and revenue figures defined in the study are actually what are being reported.

Of course, this study could be improved by a larger sample. Although a study of twelve institutions represents one of the largest comparison studies to date, the inclusion of all community colleges in the state of Illinois would provide a still clearer picture of cost-efficiency and return on investment.

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UNIT 6:

ACTIVITY-BASED COSTING MODELS FOR ALTERNATIVE MODES OF DELIVERING ON-LINE COURSES

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Abstract: In recent years there has been growth in online distance learning courses. This has been prompted by; new technology such as the Internet, mobile learning, video and audio conferencing; the explosion in student numbers in Higher Education, and the need for outreach to a world wide market. Web-based distance learning is seen as a solution to problems of outreach and course delivery.

This paper considers module costing models to compare the costs of delivery of:

- A traditionally delivered face-to-face module,
- A web-based distance learning module delivered by in-house academic staff
- A web-based distance learning module delivered by external contracted staff.

The model uses Activity Based Costing (ABC) utilising data from HEFCE and other sources; and with assumptions made from practice at Leeds Metropolitan University from over ten years experience of delivering web-based distance learning courses.

Using the models; different scenarios can be run. The paper concludes that there are savings to be achieved by utilising Web-based distance learning. This saving could, in turn, be passed on to students. Furthermore, the student experience, in terms of contact does not have to suffer and may in fact be enhanced by utilising Web-based distance learning.

Keywords: *Financial Cost, Activity Based Costing, Delivery, Finance, Cost Modelling*

Introduction

Dame Lynne Brindley, Chair of the UK's Online Learning Task Force, in an interview in the Times Higher Education (Attwood, 2010) recently stated that "the best examples of on-line learning were not cheap alternatives". The same issue also carried a report that budget cuts are driving The University of California, Berkeley to offer fully online undergraduate degree programmes. However, whilst web-based distance learning has been in operation for several years and there is a wealth of research into pedagogic models for developing and delivering web-based distance learning material; research in to the actual costs of such development and delivery has been limited.

Rumble was a pioneer, considering the economics behind distance learning since the early 1990s. Cohen and Nachmias (2006) looked at the broad picture of providing a cost benefit analysis for implementing Web supported academic instruction. Vilaseca and Castillo (2008) also look at the economic efficiency of e-learning. Ling-yun et al (2007) Considered Return on Investment in E-Learning. Garbett (2004) developed a 5 year DCF chart showing the costs in developing and delivering a distance learning course.

The National Board of Employment, Education and Training (1994) "Costs and Quality in Resource-Based Learning On and Off Campus" produced by the Australian Government carried a detailed analysis of costs of distance learning from a range of Universities. However, at that time, the report was mainly concerned with print media and the use of Virtual Learning Environments was in its infancy.

There has been little research into the actual costs of delivering a module by web-based distance learning, using an Activity-Based Costing methodology and actual data from TRAC and from practice.

This paper seeks to fill this gap. The following pages present a series of cost models for distance learning.

The models compare the costs of delivering a typical Level 7 (Masters Level) module by three alternative delivery methods:

- A traditionally delivered face-to-face module,
- A web-based distance learning module delivered by in-house academic staff
- A web-based distance learning module delivered by external contracted staff.

Masters Level modules are used in the model as:

- a. This reflects current expertise at Leeds Metropolitan University. The Leeds Metropolitan University MSc in Facilities Management has been delivered via the web since the late 1990's and is believed to be the first fully web-based Masters Level course world-wide.
- b. Masters Level students are likely to be more independent than students at lower levels and, therefore, more suitable for distance learning.

Although the examples used in the following models are at Masters Level, the model itself could be utilised for other levels.

Costs

Total Cost is the sum of Fixed Costs plus Variable Costs plus Semi Variable Costs. ($TC = FC + VC \times N$)

In the following cost calculations:

Fixed Costs include, for example, costs associated with Exam Boards. The Exam Board incurs expenditure irrespective of how many students are involved. Similarly, for traditional Face to Face delivery, there will be a fixed cost for delivering a lecture, irrespective of the number of students in the lecture. In practice, a large number of students would require a large lecture hall which would incur more costs than a small lecture delivered in a classroom, however, for the purposes of these models, the marginal difference in room costs is minimal and can be ignored.

Variable Costs include items such as assessment, individual tuition time. Clearly, the total time spent on assessing students' work varies with the number of students.

Semi Variable Costs arise, for example, with accommodating and staffing tutorials. As the number of students increases, there is an incremental point at which an additional tutorial session is required. In the accompanying spreadsheets maximum tutorial sizes can be adjusted. If student numbers exceed the maximum for a tutorial group, additional tutorial sessions are entered into the cost equation.

Assumptions

For each model the same assumptions are made. These assumptions are grounded in practice and based on a Masters (Level 7) module as delivered on the Leeds Metropolitan University MSc Facilities

Management, MSc Building Surveying and MSc Quantity Surveying Commercial Management courses.

1. Modules comprise standard band B, 20 credit points, nominal 200 hour, modules.
2. The material already exists in an appropriate web-based distance learning format, therefore the costs of developing that material have been amortised and there is no further cost involved in developing new material. The cost of updating and maintaining the material is built into the models.
3. The module is delivered during a standard 15 week semester; 13 teaching weeks.
4. Academic time is costed at £429 per day or £57 per hour. This cost is based on an academic member of staff mid range on scale eight (Senior Lecturer) as used in Transparent Approach to Costing (TRAC) guidelines.
5. Administrative time is costed at £370 per day or £49 per hour. This cost is based on a scale six administrative person and, again, comes from the Transparent Approach to Costing (TRAC) guidelines.
6. Module material is updated after every delivery. This maintenance requires 10 hours of academic time
7. Each item of assessment, at Masters Level, takes one hour of academic time to mark, provide feedback and returned to the student. This may be generous, but is based on a compromise between: the results of a survey undertaken by the University and College Union, Open University Branch, which found that the average assessment takes one hour 48 minutes to mark; and the allowance made by the Open University of 45 minutes to mark an assessment.
8. An allowance for academic time for contact with individual students, outside of formal teaching sessions or assessment, is built into the model.
9. A proportion of academic and administrative time taken up with the Exam Board is included in the model.
10. Admin support in terms of admissions or other queries is built into the model.
11. There is no percentage deduction from gross income made to cover any contribution to central overheads. A relevant proportion of the overall University overhead from TRAC of £3695 per Full Time Equivalent (FTE) student, per course is incorporated in the model.

Income

In England, income comprises; Higher Education Funding Council for England (HEFCE) income per student per module; plus fee income per student, per module. For the models a total income of £905 per student per module has been used. This can be readily varied in the model.

Model One: Traditional Face to Face Delivery.

This model looks at a module delivered by traditional face-to-face delivery.

Face To Face Delivery - Cost Assumptions

1. For parity with the distance learning modules, it is assumed that these are part-time students.
2. Admin support, per student, for the module comprises two hours for one administrator costed at £49 per hour.
3. Delivery comprises 12 one-hour lectures +1 one-hour tutorial per tutorial group per week; costed at £57 per hour. The lecturer delivers 1 lecture and 2 tutorials per week over a 12 week teaching period. The number of tutorial sessions varies according to: the maximum number of students per tutorial group and the total number of students taking the module. For example, if a total of 30 students are the taking the module, a tutorial group maximum size of 10 requires 3 tutorial sessions per week.
4. There are two items of assessment, each of which takes one hour for marking and feedback costed at £57 per hour.

5. There is further student-tutor contact on an individual basis via; visits to the office, e-mails, phone calls, etc, comprising a total of two hours per student during the semester, costed at £57 per hour.
6. There are printed handouts distributed to students.
7. As there are eight modules to the course the University overhead (item 11 above) of £3695 per FTE per course equates to £462 per FTE per module. For part-time students, the FTE is reduced by 50%.
8. Contribution to the cost of the Exam Board is 4 full days for admin staff per course (half a day per module) plus one full day for academic staff (.125 days per course).



Figure 1: *Face to face delivery*

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As the students are at a distance it is likely that there will be increased requirement for admin support. Therefore costs for admin support have been increased to 3 hours per student for one administrative person costed at £49 per hour.

Maintenance costs remain the same at 10 hours to update materials at £57 per hour.

There are no costs for lectures or face to face tutorials. An allowance for four online tutorials, using Elluminate or similar, each comprising one half-hour tutorial has been built in. This is based on existing practice on the MSc Facilities Management and MSc Building Surveying at Leeds Metropolitan University.

Assessment remains at 2 points of assessment.

Contact with individual students by e-mail or phone calls etc is increased to two hours per student.

Although there are no hard copy handouts an allowance has been made for assignments which may be submitted online and staff may elect to print hard copies of their assignments.

The allowance for university overheads, based on £3695 per FTE per course has been reduced by 50% to remove accommodation costs (tutorial rooms and classrooms) from the equation. As before, the allowance per course has been divided by 8 and by 2 to arrive at a cost per module per part-time student.

This results in an overall cost of £1422 per student.

Break even point is achieved with three students.

COSTING MODEL	Module Title	In-House OL Delivery	Costs(s)	MSc (Level 7) Module		
INCOME						
HEFCE Income	£280	p student p module	Admin	£370	p day	£49
Fee Income	£525	p student p module	Academic	£425	p day	£57
			Contribution to Central overheads	£3,605	per FTE	
			Printing	£0.03	per COURSE	£115
						50.00% accom costs
-£460						
MODULE COSTING						
INCOME			Student	Module	Totals	
HEFCE Income						
say	£280	p student				
Fee Income	£525	p student				
Gross Income						
Assume	1	students				
Total GROSS Income			£905	£905	£905	
OUTGOINGS						
Contribution to Central overheads	£115		£115	£115	£115	
Admin Support						
Admissions, queries, support	2	hrs	1	admin, p student		
say	£49	p/hr				
Assume	1	students	£98	£98	£98	
Module Costs						
a) Development Costs	0			0		
b) Maintenance Costs						
Assume have to maintain modules, update materials	10	hrs @	19	hrs updating		
say			£57	p/hr	£570	
c) Delivery Costs						
Fixed Costs						
Lectures	0	1 hr lectures	0			
Tutorials	0	1 hr Tutorials	0			
Other Delivery	4	1/2 hour OLT	4			
Total			2	hrs @	£114.00	
			£57	p/hr		
Variable Costs						
Assessment	2	assessments	2.00	hrs p student @		
Marking and feedback, say			£57	p/hr	£114	
Individual Tuition			2	hrs @	£114	
Contact with individual students			£57	p/hr	£114	
Emails, phone calls etc, say			1	students		
Printing & Repro			40	pages p student		
Printing off student submissions			£0.03	p page	£1.20	
Other			0	students	£1.20	
Overheads p student			00		£0.00	
TOTAL COST P MODULE			1	students	£913	£913
ADMINISTRATION						
Exam Board	0.125	day	1	academic		
	£429.00	p day p academic			£53.63	
	0.5	day	1	admin		
Exam Board Total					£186.00	
TOTAL COSTS					£239	£239
			£443	£1,365	£1,365	
PROFIT/LOSS						
Gross Income p student	£905.00					
Total Gross Income per MODULE		1 student per MODULE				
Total Cost per MODULE			£906			
Net Income p module			£1,365			
Profit/loss			-£460			
					Per Module	

Figure 2: In-house web-based distance learning delivery

Model Three: Externally house delivered (Outsourced), web based distance learning.

This mode is essentially the same as Model Two. However, instead of tuition being delivered by in-house academic staff; tuition is provided by external staff, similar to the Associate Lecturer employed by the Open University. In effect, tuition is outsourced to external providers. These tutors could be retired academics or professionals, "portfolio" employees, etc.

Unlike the Open University Associate Lecturer, who is employed on a nominal hourly basis, external tutors under the outsourcing model are recruited on a price per student basis.

Clearly, there would be costs involved in training p-t staff and updating their skills. For staff recruited ab initio into teaching, it is reasonable to assume an initial 3 day course at a cost of say, £900 (£300 p day). If utilising retired academic staff, this initial training would not be required.

In addition, there would be a requirement for ongoing staff development, estimated at, say 10 hours training per annum at £35 p hour, i.e. £350 pa.

These costs have not been included in the presented model. Staff training and development has not been included in the other two models and in each case is assumed to be a central overhead covered by the University overhead.

On the outsourcing model, admin support is further increased to 4 hours per student, to allow for any increased contact between the University and the tutor or for students having difficulty contacting the tutor.

An additional item is included for in-house staff monitoring and managing the module. It is assumed that a defined sample of assessments will be monitored by the in-house tutor. This may be particularly relevant if there are large numbers of students and several outsourced tutors. Management and monitoring has been assumed at ½ hour in-house staff time, per student.

Module updating and maintenance is undertaken by the in-house staff and, as previously, costed at 10 hours at £57 per hour.

All delivery is included in the cost per outsourced tutor, per student. In the presented example, this is £150 per student to include; costs of administering on line tutorials, assessment and feedback, and any individual tuition.

Assessment remains at 2 points of assessment.

Contribution to Exam Board expenses remains as previous.

MODULE COSTING MODEL

COSTING MODEL	Module	Out-sourced DL	Course(s)	MSc (Level 7) Module
INCOME	Title	Delivery	COSTS	
HEFCE Income	£280	p student p module	Admin	£370 p day
Fee Income	£625	p student p module	Academic Staff	£429 p day
			Academic Part-time	£150 p. STUDENT
			Contribution to	per FTE
			Central overheads	£3,695 per COURSE
			Printing	£0.03 p page
				£115 50.00%

MODULE COSTING

INCOME	Student	Module	Totals
HEFCE Income			
say	£280	p student	
FEE Income			
say	£625	p student	
Gross Income			
Assume	1	students	
Total GROSS income		£905	£905

OUTGOINGS	Student	Module	Totals
Contribution to Central overheads			
say	£115		£115

Admin Support			
Admissions, queries, support			
4	hrs	1	admin, p student
£57	p.hr		
Assume		1 students	
Monitoring and Management			
1	Students	0.5	hrs p student @
		£57	p student
		£228	
		£0	
		£0.00	

Module Costs			
a) Development Costs			
0			
b) Maintenance Costs			
Assume have to maintain modules, update materials			
Say			
10	hrs @	£57	hrs updating
			p.hr
c) Delivery Costs			
Fixed Costs			

Lectures			
0	1 hr lectures	0	
Tutorials			
0	1 hr Tutorials	0	
Other Delivery			
1	p.student	£150	
	Students		£150.00
Total			£0.00

cii) Variable Costs			
Assessment			
2	assessments		
Marking and feedback, say		0.00	hrs p student @
			1 students
Individual Tuition			
Contact with individual students		0	hrs @
Emails, phone calls etc. Say		£0	p.hr
			1 students

Printing & Repro			
Printing off student submissions		0	pages p student
		£0.03	p page
		1	students
Other		0	
Overheads p student		£0	
		1	students
TOTAL COST P MODULE			£720

d) ADMINISTRATION			
Exam Board			
0.125	day	1	academic
£429.00	p day p academic	£53.63	
0.5	day	1	admin
£0.00	p.day p admin	£370.00	
Exam Board Total			£424
TOTAL COSTS		£257	£1,144

PROFIT/LOSS	
Gross Income p student	£905.00
Total Gross Income per MODULE	1 student per MODULE
Total Cost per MODULE	£905
Net Income p module	£1,172
Profit/loss	-£267

Notes

in contract

£267

Per Module

Figure 3: Outsourced web-based distance learning delivery

On these assumptions, the cost per individual student is £1,172. Break even is achieved at two students, (if the annual CPD for tutors is included in the module cost, break even is achieved at 4 students).

Student individual contact

Face to Face Student Contact

The traditional Face to Face delivery postulated above allows for varying contact in tutorial time. Assuming, say 13 students per tutorial group over the semester this equates to 1 hours personal contact in tutorials, (though this proportion varies with the numbers of students and tutorials). There is also the equivalent to 2 hours individual attention in assessment and feedback, plus 1 hour additional contact outside of scheduled hours. Total individual academic time is 4 hours.

In-House Distance Learning Student Contact

In-house delivery of distance learning allows for 2 hours individual contact, plus the equivalent of 2 hours individual attention in assessment and feedback.

There is also the opportunity for individual contact during the on-line or audio tutorials. The suggested four half-hour tutorials are based on practice on some Leeds Met modules. At four students, this gives $\frac{1}{2}$ hour individual attention; though clearly this diminishes as the student numbers rise. Total individual academic time is 4+ hours.

Outsourced Distance Learning

The outsourced distance learning model has the same assumptions as the in-house distance learning model. In addition, there is the equivalent to $\frac{1}{2}$ hour individual attention in the monitoring process.

Total academic time for the individual student is $4\frac{1}{2}+$ hours.

Conclusion

Marginal Costs and Revenue

Marginal costs and revenue can be calculated for a range of students.

This can be graphed to show marginal Profit/Loss

Marginal Profit/Loss Profiles			
F2F	In House DL	Outsourced DL	
Profit/Loss	Profit/Loss	Profit/Loss	Students
-£1,838	-£460	-£267	1
-£1,385	£2	£459	2
-£932	£464	£1,186	3
-£479	£927	£1,912	4
-£26	£1,389	£2,639	5
£427	£1,851	£3,365	6
£879	£2,314	£4,092	7
£1,332	£2,776	£4,818	8
£1,785	£3,238	£5,545	9
£2,238	£3,701	£6,271	10
£2,691	£4,163	£6,998	11
£2,403	£4,625	£7,724	12
£2,856	£5,088	£8,451	13
£3,308	£5,550	£9,177	14
£3,761	£6,012	£9,904	15
£4,214	£6,475	£10,630	16
£4,667	£6,937	£11,357	17
£5,120	£7,399	£12,083	18
£5,573	£7,862	£12,810	19
£6,026	£8,324	£13,536	20
£6,478	£8,786	£14,263	21
£6,931	£9,249	£14,989	22
£7,384	£9,711	£15,716	23
£7,096	£10,173	£16,442	24
£7,549	£10,636	£17,169	25
£8,002	£11,098	£17,895	26
£8,455	£11,560	£18,622	27
£8,908	£12,023	£19,348	28
£9,360	£12,485	£20,075	29
£9,813	£12,947	£20,801	30
£10,266	£13,410	£21,528	31
£10,719	£13,872	£22,254	32
£11,172	£14,334	£22,981	33
£11,625	£14,797	£23,707	34
£12,078	£15,259	£24,434	35
£11,789	£15,721	£25,160	36
£12,242	£16,184	£25,887	37
£12,695	£16,646	£26,613	38
£13,148	£17,108	£27,340	39
£13,601	£17,571	£28,066	40
£14,054	£18,033	£28,793	41
£14,507	£18,495	£29,519	42
£14,959	£18,958	£30,246	43
£15,412	£19,420	£30,972	44
£15,865	£19,882	£31,699	45
£16,318	£20,345	£32,425	46
£16,771	£20,807	£33,152	47
£17,224	£21,269	£33,878	48
£17,677	£21,732	£34,605	49
£18,130	£22,194	£35,331	50

Figure 4. Table of comparable costs/income

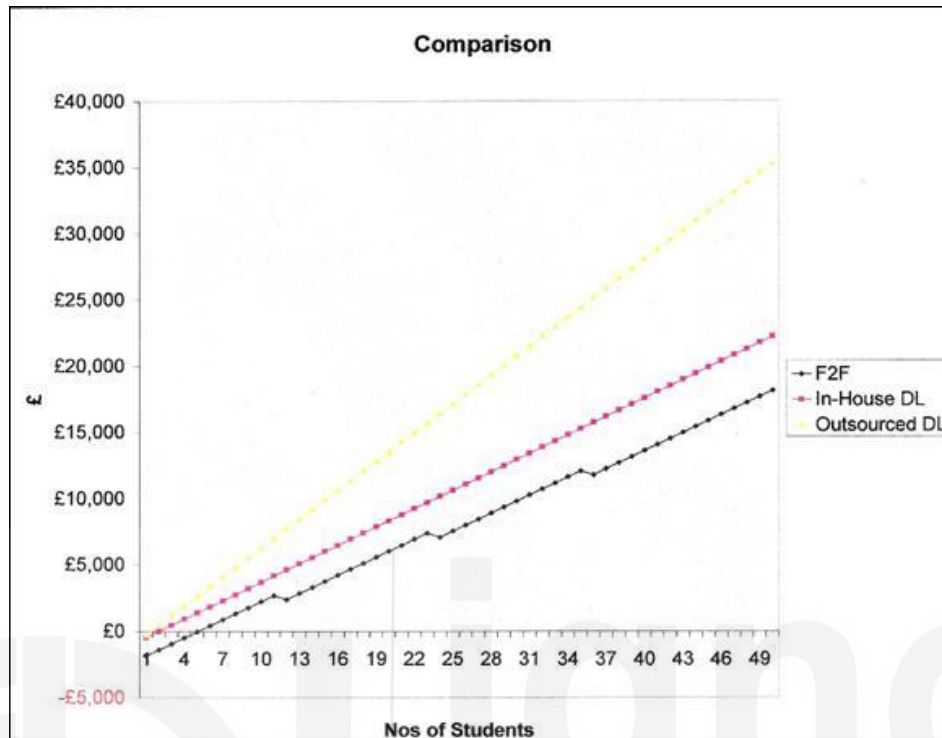


Figure 5: *Graph of costs/revenue alternative forms of delivery*

The least cost effective method of delivery is the traditional face to face lecture. The most cost effective is the outsourced method of distance learning, more than twice as profitable as face to face learning.

The model can be varied to show the effects of differential changes. For example, if Distance Learning courses are given a further assessment to promote staff-student contact, the cost profiles move; but distance learning still shows a distinct advantage over face to face delivery, at least in smaller class numbers; there is some divergence as numbers rise.

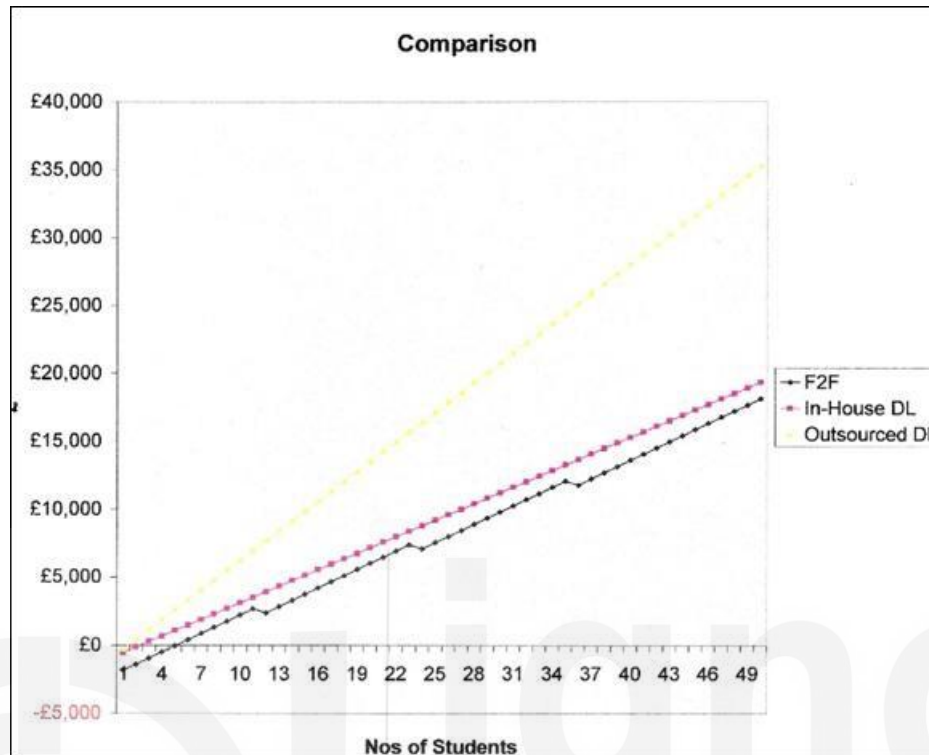


Figure 6: Graph of costs/revenue alternative forms of delivery, 2 Assessments C/F 3 Assessments for Distance Learning

Recommendations and further considerations

The above models, of course, assume that all material is already available in distance learning format. The cost of producing, or converting material into Distance Learning format has to be incorporated into any models where distance learning is being developed ab initio. However, costs of producing material are falling as more material becomes available in the form of Open Access Learning Objects.

With, say 15 students, the net surplus for in-house web based delivery is £5,157 compared to a surplus for traditional face to face delivery of £3,761. Assuming that the module is delivered once per year, this gives a net annual surplus of £1,396 pa. Capitalising this at, say, 4% yield gives a Capital Equivalent of £34,900

Similarly, the Capital Equivalent of the surplus from in-house web-based delivery is £153,575.

These figures; £34,900 and £153,575 represent the capital available to produce the web-based material.

The costs of producing a distance learning module are currently being researched as a separate exercise.

A further consideration is the relative costs to the student of studying full-time, attended part-time, or by distance learning. Again, this is being separately researched.

Environmental costs of different forms of delivery also have to be considered. Clearly there environmental benefits in distance learning in terms of: journey to work (study) costs, land and buildings usage, and production of hard copy materials. Again, this is subject to separate research.

Appendix A

DISTANCE LEARNING COURSES
FINANCIAL APPRAISAL

Chris Garbett

COSTING MODEL		Module		Traditional F2F Delivery		Course(s)		MSc (Level 7) Module	
HEFCE Income	280	p student	p module			370	p day	49	p hr
Fee Income	625	p student	p module			429	p day	57	p hr
				Contribution to Central overheads		3695	per FTE		per COURSE
				Printing		0.03	p page		per MODULE
				Tutorial size max		12	Students		

MODULE COSTING		Student		Module		Totals	
HEFCE Income	=B4	p student					
Fee Income	=B5	p student					
Gross Income							
Assume	1	students					
Total GROSS income			=SUM(B12:B14)		=F17*B16		=G17

OUTGOINGS		Student		Module		Totals	
Contribution to Centre	=B5*B16		=B5		=B21		=G21
Admin Support							
Admissions, queries, etc	1	hrs	1	admin, p e			
Assume	=B16	students			=A26*A25*C25		=H25
							=F52*H25

Module Costs		Student		Module		Totals	
a) Development C							=A32
b) Maintenance C							
Assume have to maintain modules, update materials							
Day	10	hrs @					=A37*C37
c) Delivery Costs							
Fixed Costs							
13	hrs @						
Tutorials	=A43						
Other Delivery	=A47						
Total	=C47+C48+C43	hrs @					=C49*C48
d) Variable Costs							
Assessment							
Marking and feedback	=A53	hrs p stud					=C53*C54
Individual Tuition	=B16	students					=F56*C56
Contact with individual students	1	hrs @					
Emails, phone calls etc. Day	=B16	students					=C58*C59
Printing & Repro	40	pages p st					=F84*C64
Other							
Overheads p student	=B5*B16	students					=F68*C68
TOTAL COST P MOD							=SUM(C63:C68)

ADMINISTRATIVE		Student		Module		Totals	
Exam Board							
0.125	day	1	academic				
0.5	p day p acad						=A74*C73*A73
0.5	day	1	admin				
Exam Board Total							=A73*C75*A75
TOTAL COSTS							=SUM(F26:F77)

PROFIT/LOSS		Student		Module		Totals	
Gross income p stude	=F17						
Total Gross income per							
Total Cost per MODULE	=H79						
Net Income p module	=D86-D87						

Per Module

Figure 7: Spreadsheet for F2F delivery, showing formulae

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UNIT 7:

PRIVATE COST OF EDUCATION: A COMPARATIVE STUDY OF DISTANCE AND CAMPUS-BASED UNIVERSITY STUDENTS IN NIGERIA

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Abstract: This paper examines the comparative private costs of distance and conventional (classroom-based) university students in Nigeria. A total of 200 subjects comprising students registered for the B.Sc. Computer Science and B.A. English Studies programmes at the University of Lagos, Nigeria and the National Open University of Nigeria (NOUN) were randomly selected as samples for this study. Structured oral interview was also used to collect information from tutors and facilitators as well as counsellors at the NOUN study centres. Two hypotheses were drawn from the statement of the problem using simple percentage statistical analysis to determine whether or not there are private costs borne by higher education students in Nigeria. The study sought to establish which of the two modes of education demands a higher or lesser private investment from students in participating in higher education. Findings reveal that significant private costs learners generally incur both at the pre-entry as well as during the course of their studies for higher education in Nigeria generally. It was also found that the private costs for students studying through education via the distance learning mode (like NOUN) were significantly lower than those involved in pursuing university education via the conventional education mode such as the University of Lagos. The paper concludes by advocating for greater emphasis on open and distance learning methods for university education and training in Nigeria and other developing countries. It also recommends that funding agencies and scholarship granting organizations would reach a larger number of interested grantees by exploring the distance learning approach, whose costs are generally lower and which requires a much lower private contribution from learners

Keywords: *Educational cost, private cost in distance education, comparison of distance learning and campus learning, distance education in Nigeria*

Introduction

Considerable amount of research studies conducted in the past on education and earnings has established a positive correlation between the level of education and the earnings which accrue to individuals and society. This relationship, has been the subject of numerous social and economic debates, usually explained using the 'human capital theory'. The human capital theory derives from a person's or group's productive capacity. Accordingly, labour economists assumed that the level of an individual's earnings is determined by the individual's stock of human capital. The factors that determine the development of human capital include: education, health care, on-the-job training, non-formal education, extension programmes, as well as quality social services relating to water supply, environmental protection, improved technical education and migration of workers. Educational planners and economists of education also postulate that these stocks of human capital may be increased and improved through adequate and appropriate investments in education, training and/or health care (Umo, 2002; Adedeji and Bamidele, 2002; Aigbokhan, Imahe and Ailemen, 2007).

Given these realities, it is assumed that economic benefits derived from education are futuristic in nature, that is, benefits are acquired after successful completion of education and training. Additionally, one may also assume that the benefit that accrues to the individual will be contingent on the level and/or depth of training and education that is experienced. Thus, it may be inferred that returns on educational investment that accrue to a fresh school-leaver will be less than that of a university graduate. However Friedman and Friedman (1980) state that "there was no evidence that higher education yields 'social benefits' over and above the benefits that accrue to the students themselves", and evidence provided by Bloom, Canning and Chan (2005) suggests that higher education is both a result and a determinant of income, and can produce public and private benefits far above the preceding years of schooling. In the same vein, Aigbokhan, et al. (2007) attributed the development of specialized human capital in Nigeria to tertiary education. The Nigerian economic sector relies on the universities and other tertiary education institutions for provision of skilled manpower to operationalise the entrepreneurial and labour components of its industrial production processes.

There are currently 117 universities in Nigeria, being the highest number in sub-Saharan Africa (*National Universities Commission, 2011*). However, the universities are experiencing daunting pressures to increase access to more despite weakening quality and limited funding and budgetary allocations. This is both a cause and consequence of the decline in the impact of universities on human capital development and the national economy (Dabalén, Oni and Bankole, 2001; Aigbokhan, et al., 2007).

Conventional institutions are hard pressed to meet the demands of those seeking admission places and only about 15 per cent of qualified candidates could be admitted. Ipaye (2007) revealed that "from 2001 to 2006, the highest that the universities in Nigeria have been able to admit between them was 12% of the total number of applicants." An analysis of application and admission into Nigerian universities showed that some departments could not admit more than 6 per cent of the total number of applicants. Thus, distance learning was identified as an alternative approach. This is based on the notion that the approach permits a flexible, technology-enhanced and self-paced learning mode. Additionally, there is a perception of economic advantage in distance learning as being less expensive than campus-based education (Hulsmann 2000). However, there is currently no empirical basis for assuming that distance education in Nigeria is cheaper than conventional system, especially in terms of private costs borne by each learner. If the growing popularity of open and distance learning system is to be sustained, there must be evidence to support claims of its cost efficiency and cost effectiveness. Analysts have argued against the continued expansion of the higher education enrolment in Nigeria (Ajayi, Adeniji and Adu 2008) based on the notion that the labour market is restricted and most of the university graduates are not being absorbed into gainful employment. Though, there is some logic in this, it contradicts the Nigerian National policy on education which states that "maximum efforts will be made to enable those who can benefit from higher education to be given access to it." This policy provision draws attention to the issue of whether universities are designed to train people for jobs or to provide specialised knowledge that would empower people. This has been a perennial debate among higher education scholars. However Akpan and Akinyoade (2008) argue that the role of higher education in a developing country like Nigeria is that it guarantees social justice for the marginalised and disadvantaged people. Access to higher education is means of empowering people from lower socio-economic class and marginal demographic profiles that are traditionally underrepresented in education, such as women, disabled people and ethnic minority groups.

One of the key objectives of distance education is that it seeks to widen access to higher education for all members of society, as a means of providing them with 'voice' in society. Given the limitations of conventional education, which has lost momentum and could not expand much further to cater for the underprivileged groups, the distance learning option seems realistic. In this paper the cost issues associated with provision of distance higher education are examined in comparison with conventional education, especially those that are associated with the private costs of learners.

Cost efficiency and cost effectiveness of distance education

Both cost efficiency and cost effectiveness analyses have become less popular in educational studies, especially in the field of distance education, probably because it is considered an already established case. However, many providers of distance learning programmes do not know what their programmes

cost, especially from the point of view of the learners. The justification is to provide a comparison of the costs of distance learning and conventional education approaches, based on the learners' perspective and experience. Though, Educational costs are divided into social, private and psychic costs, there is a need to estimate the proportion of the private costs of the two approaches, in order to determine the comparative cost effectiveness. This study aims to contribute to the growing literature on educational costs analysis and economics of distance education in Nigeria, by offering new rationale for the adoption of the distance learning by prospective university students.

With increasing budgetary constraints to provision of education, a delivery system that is cost effective is needed. Distance education programmes, when properly planned and executed, are cost effective to both the nation and the student (Jegede, 2004). However, development of distance learning programmes are often accompanied by huge initial capital outlay on things such as warehousing, information and communication technology infrastructures, recruitment and training of staff, design and development of instructional materials, and hiring of part-time staff. Despite the high level of initial fixed costs, distance learning can achieve economies of scale and average costs that are lower than traditional educational institutions. These average costs are usually measured in terms of students (usually the cost per full-time equivalent student), courses, student hours, and graduates (Rumble, 2002).

Private costs of distance and conventional education

Institutional costs refer to those costs that are borne by the institution and/or the government, in order to ensure effective provision of instruction to learners. Whereas, private costs including household costs, are paid by students to access and participate in distance learning. This may include registration or tuition fees, examination fees, costs of tutorial sessions (if any), the transportation to and from the learning centre (for tutorials and other administrative activities). This also includes costs of practicals and replacement supplies (Belawati, 2006; Mbua 2007) also identified some other private costs that learners bear in the course of their studies, these include caution deposits and cost of uniforms for certain learners. Returning students also have to pay administrative charges for re-registration each new semester at the National Open University of Nigeria. Additionally there are costs of internet connectivity personally or via commercial cyber cafes.

Learners also bear indirect costs referred to as opportunity costs. These are estimated income that could have been earned by students if they have worked full time. Students' opportunity costs may include time devoted to studying which otherwise could have been spent for leisure or with the family. The concept of opportunity costs is important since it represents the real cost of education (Tsang, 1988), and monetary price does not always reflect the true economic value of a resource of education (Jamison, Klees & Wells, 1978). The debate on the value of opportunity costs is unresolved, however if we consider the fact that learners can spend monies currently being invested as private costs in distance learning on other things, then opportunity cost may imply the value that a resource would have in its best alternative use.

Laidlaw and Layards (1974) had considered the implications of the fact that the OU students are home-based. This means, or is generally thought to mean, that their study time displaces leisure time, whereas the study time of campus students displaces working time. Assuming that the study time is the same for both types of students, which is the costlier? It is an extreme materialist notion that no cost is involved in the reduction of leisure. However, many students may prefer study to their alternative leisure activities. If distance learners are indifferent to study and leisure and campus-based learners indifferent to study and work, then a campus student course would have additional differential cost equal to the foregone work output of the campus student. However, in the present study, opportunity cost has not been considered due to lack of stable and sustained stand on it by educational economists.

Analysts of cost studies in the field of distance education have been preoccupied with how favourably it compares with the campus-based delivery of education (Wagner, 1972, 1973; Laidlaw & Layard, 1974; Hulsmann, 2000; Rumble, 2001; Belawati, 2006). In doing this, analysts seem to have overlooked the goals of the two modes and how differentiated they are. Distance education is concerned with expanding access to learners and fostering lifelong learning opportunities for non-traditional groups of learners. The acquisition of degrees, diplomas and other certificated awards is

only one of the objectives of distance learning. It seeks to provide a framework for equality and social emancipation by widening participation in educational opportunities. Though sometimes is high incidence of high level of dropout, compared with campus-based approach, however the number of non-traditional learners served by distance education is likely to be higher than campus-based institutions. Distance learning has been used with great success to provide access to education for prisoners in Nigeria. Also, special training programmes have been designed for other special learner-groups such as women in purdah, nomadic learners etc. (Olakulehin and Ojo, 2006). Thus, distance education adds greater value in terms of personal and social benefits to diverse groups than campus-based institutions can offer.

Regrettably, measures of costs based on units of education achieved other than degrees and on concepts of "added-value" are not yet popular. This leaves only less satisfactory measures such as cost per registered full-time equivalent year of study. Such calculations favour distance education institutions because lower course pass rates are not brought into the equation. Early studies of the UK Open University (OU) indicated that it produced graduates at about half the costs of other universities (ADEA, 2002). A study undertaken by the Department of Education and Science in 1981 found that a three year full-time equivalent (FTE) degree at the OU cost GBP 4, 890 compared to an average of GBP 8, 550 in other universities. A four year FTE degree costs GBP 7, 984 at the OU and GBP 11, 842 elsewhere. The differences were even greater when calculated in terms of public fund costs (GBP 4,356 compared to GBP 10, 801 for a three-year FTE degree) and total economic costs (GBP 7,116 compared to GBP 17, 843) (Department of Education, 1981). The differentials have narrowed somewhat since 1981 because the proportion of under-qualified students entering the OU has increased and unit costs in other universities have fallen. Traditionally cost of an OU graduate is less than two-thirds that of a full-time graduate in other universities (Horlock, 1984).

A confidential study undertaken by the Department for Education and Science in 1991, compared cost of OU degrees with part-time degrees offered by three conventional institutions. It found that a three-year FTE degree at the open university costs less than 60 per cent of the average of the other universities. These are impressive statistics, but they are not unique. Other distance teaching universities with similar teaching systems achieve similar rates. For example, the Allama Iqbal Open University in Pakistan, which is modelled after the OU, achieves costs per graduate that are 45 to 70 per cent of the cost of conventional universities (Perraton, 1994). Additionally, the Hong Kong Open university made extensive use of existing distance teaching materials from OU and elsewhere and combined these with highly resourced student support arrangements when it turned up. As a break-even institution, it was required to charge students the full cost of their courses. Its graduates paid about one-third of what a similar degree of the University of Hong Kong cost at the time (Swift & Dhanarajan, 1992). There are currently very little literature on costs of distance education and open learning in Sub-Saharan Africa. Thus, it is difficult to cite here cases of African experiences with comparative studies of distance and conventional university education. However, the National Open University of Nigeria also made use of existing resources from several other institutions around the world at inception. Despite that NOUN charges fees, the federal government also subsidizes the university by making regular budgetary allocations for capital expenditure and personnel costs. While the recurrent expenditure are covered by fees paid students and other internally generated revenue strategies.

Research questions

Though distance learning is commonly regarded as generally cost effective and more economical approach to training and education, however, there is no empirical basis for stating that distance learning in Nigeria is comparatively cheaper than conventional education method. This apparent gap in research literature makes it difficult for prospective learners and/or funding agencies and organisations to determine the cost effectiveness or otherwise of distance learning system.

This paper seeks to investigate and compare the private costs of distance and conventional university education in Nigeria with a view to determining which is more cost efficient. Case studies of the National Open University of Nigeria (NOUN) and the University of Lagos (UNILAG) are considered in this exercise.

To address the objectives set out above, the following research questions are identified:

- a. What are the various private costs borne by students in the open and distance learning system and the conventional university system in Nigeria?
- b. Which of the approaches is more cost efficient in terms of private costs borne by the learners?

Methodology

Research design

Using the descriptive survey method, a combination of quantitative (questionnaire) and qualitative (interview) data collection and analytical techniques were used for this study with the aim of detailing the comparative cost effectiveness of private costs of conventional and distance learning university students in Nigeria.

Population and sample

All the students registered in the year 2007 for two bachelor's degree programmes of the two institutions - National Open University of Nigeria and the University of Lagos - constituted the population for the study. Using a stratified sampling technique, 200 students (100 from each institution) were randomly selected as samples. The two institutions represented the progressive nature of higher education in Nigeria - UNILAG as the largest dual-mode university and NOUN as the only open university in the country.

At the second stage, the programmes on offer by the two institutions were identified, in order to determine similarity in the list of programmes offered by the institutions. This was done by an analysis of the student handbooks and programme brochures of the two institutions. Two programmes B.A. English Language Studies and B.Sc. Computer Science were selected for the purpose of this study. These are the most popular programmes in the two institutions, having high enrolment rates.

Given that the National Open University of Nigeria is yet to graduate its first cohort of students, the researchers decided to administer the research instrument on only the second year students of the two institutions. It was considered that, at this level, they had completed at least a full session of academic activities in their respective institutions under the selected programmes.

Data from the academic registry division of the University of Lagos revealed that there were 486 and 529 students registered for both B.Sc. Computer Science and B.A. English Studies respectively. While data from the National Open university of Nigeria indicated that 492 and 517 students were registered from both B.Sc. Computer Science and B.A. English Language respectively. Adequate and representative samples – modified to a 10% round-off figure per group -were selected for the two programmes under each institution. In order to ensure that the selected samples are from a relatively similar socio-economic environment, the NOUN student samples were selected specifically from the Lagos Study Centre, in which over 55% of registered students of the university are located. Thus, 50 students per programme per institution led to a total sample of 200 students.

Tools used

The Private-Costs of University Students Rating Scale (P-CURS), an adaptation of a questionnaire developed by Gaba, Panda and Murthy (2007) at the Staff Training and Research Institute of Distance Education (STRIDE), Indira Ghandi National Open University is used to collect data for this study. The instrument is a structured questionnaire which sought the opinions and perceptions of students regarding the costs that they bear in pursuance of their programmes. For the NOUN students, the instrument was administered at the Lagos study centre during the registration exercise for the new semester, while the instrument was administered on the UNILAG students just before the commencement of their class lectures. The questionnaires were collected immediately on completion.

Analysis and Results

Two hundred completed questionnaires were analysed by using simple statistics, i.e. percentage analysis for each of the questions. The results are given in the following tables and subsequent interpretations.

Characteristics of respondents

The characteristics of the respondents sampled for this study are presented in Table 1.

Table 1 *Biographical characteristics of respondents*

VARIABLE		UNILAG (N=100)	NOUN (N=100)
Gender	Male (129)	68	61
	Female (71)	32	39
Age	21-30	73	45
	31-40	27	41
	41-50	-	12
	51-60	-	2
	Above 60 years	-	-
Marital status	Single	92	67
	Married	5	29
	Separated	-	-
	Divorced	-	1
	Widowed	-	2
Employment status	Student	85	34
	Employed	4	42
	Unemployed	6	11
	Self-employed	5	13
Qualification before current registration	SSCE/GCE	79	61
	NCE/ND	8	17
	HND/ B.Sc.	2	19
	M.Sc.	-	3

Analysis of the biographical information provided by the respondents indicated that the sample comprised 129 males and 71 females. Among those, 59 percent were between the 21-30 years age-range, while 34 percent were between the 31-40 years age-range and the remaining 7 percent, (who were essentially NOUN students) were within the 41-60 years age-range. In addition, about 80% of the respondents were single, while 17 percent were married, and 3 respondents only had indicated that they were either divorced or widowed (and, four respondents had not indicated their status). About 60 percent respondents were full time students, while 22 percent indicated that they were employed, and 9 percent each respectively indicated that they are either unemployed or self-employed. Finally, 70 percent of the respondents had only the Senior Secondary School Certificate (SSCE) or General Certificate Examination (GCE) before enrolling for their current programme, while about 13 percent held either the National Certificate of Education (NCE) or the National Diploma and

about 10 percent respondents already possessed Higher National Diplomas or the bachelors degree before enrolling for the current programme. Only 3 respondents from NOUN already held Master's degree before registering for the current programme.

Income

The responses provided by the sample respondents for each cluster of samples-

UNILAG and NOUN- are provided in Tables 2a, 2b, 2c (UNILAG) and Tables 3a, 3b, 3c (NOUN).

i) UNILAG

Table 2a. Residential information

S/N	Item	Yes	No
1	Are you resident in the University hostel or any other privately owned Hostel?	82	18
2	Are you staying with your nuclear family or some other relative?	18	82
Total		100	100

Table 2b. Average personal income (monthly)

Income range	Number of Respondents
(a) < N3500	6
(b) N 3501- 7000	62
(c) N 7001-10000	16
(d) N 10001-15000	13
(e) N 15001- N 20000	3
(f) > N 20000	6
Total	100

Table 2c. Average household income (monthly)

Income range	Number of Respondents
a) N 15000 – 25,000	12
b) N 25001- 45, 000	19
c) N 45001- 55000	23
d) N 55001-75000	32
e) N 75001- 100000	11
f) > N 100,000	9
Total	100

ii) *NOUN*

Table 3a. Residential information

S/N	Item	Yes	No
1	Are you resident in the University hostel or any other privately owned Hostel?	8	92
2	Are you staying with your nuclear family or some other relative?	92	8
Total		100	100

Table 3b. Average personal income (monthly)

Income range	Number of Respondents
(a) < N3500	0
(b) N 3501- 7000	11
(c) N 7001-10000	9
(d) N 10001-15000	9
(e) N 15001- N 20000	4
(f) > N 20000	67
Total	100

Table 3c. Average household income (monthly)

Income range	Number of Respondents
a) N 15000 – 25,000	16
b) N 25001- 45, 000	21
c) N 45001- 55000	14
d) N 55001-75000	38
e) N 75001- 100000	6
f) > N 100,000	5
Total	100

Information on private costs

Table 4a. Average private expenditure related to studying (Figures in Naira; 1US\$ = N158)

Items	UNILAG	NOUN
Pre-entry stage	N	N
a) Prospectus	3,650	2500
b) Registration fee	15,000	5000
c) Transportation	3500	3000
d) Counselling	-	2000

e) News paper	-	-
f) Telephone	1500	2000
g) Caution deposit	20,000	7,500
h) Fax (hire)	-	-
i) Web/Emails (hire)	5000	5000
Total	48,650	25,000
Entry stage (while studying)		
a) Purchased additional books for the course	25,000	10,000
b) Private coaching	10,000	5,000
c) Viewing audio/video/CDs	-	2000
d) Purchased audio/video/CDs	5,000	5,000
e) Stationery items	10,000	6,000
f) Expenditure on attending teleconferencing	-	2,000
g) Attending counselling sessions	-	2,500
h) Expenditure on submission of assignments	12,000	8,000
i) Expenditure on collection of corrected assignments	-	2000
j) Project preparation	4000	-
k) Expenditure on library reference	-	2000
l) Expenditure on practical sessions	15,000	10000
m) Telephone	2000	2,500
n) Fax (hire)	-	-
o) Web/Email (hire)	2000	2,500
p) Submission of examination form	-	-
q) Examination fees	20000	12,000
r) Transportation	2000	5000
s) Professional fees	-	-
Total	107,000	76,500

It is generally argued that university students whether they are engaged in studying through the conventional approach or through distance learning tend to bear a significant proportion of expenditure associated with their studies. Judging from Table 4a, it will be observed that the students under the two educational approaches bear a number of expenditures that are not institutional, yet they are related to the academic of the learners.

The responses from the samples as provided in Table 4a indicate that on the average, students spend on a number of items even at the point of indicating their interest in registering for the programmes. There spending heads include: prospectus and application fees, registration, transportation, counselling (information search), telephone, caution deposit, internet connectivity etc. The results also show that on the average, students of the university of Lagos spend up to N48, 650 on these pre-entry stage activities; while students of the National Open University of Nigeria spend an average of N25, 000 on pre-entry activities such as calls, purchase of forms, transportation, counselling etc. Furthermore, N107, 000 was spent on the average by students of the University of Lagos after their

acceptance into the programmes; while students of the National Open University of Nigeria spend about N76,500 on their studies after registration activities.

Pre-entry stage

Table 4b. Average private expenditure related to studying pre-entry stage

Items	UNILAG	%	NOUN	%
Pre Entry Stage	N		N	
a) Prospectus	3,650	8	2500	10
b) Registration fee	15,000	31	5000	20
c) Transportation	3500	7	3000	12
d) Counselling	-		2000	8
e) News paper	-		-	
f) Telephone	1500	3	2000	8
g) Caution deposit	20,000	41	7,500	30
h) Fax (hire)	-		-	
i) Web/Emails (hire)	5000	10	5000	20
Total	48,650	100	25,000	100

Table 4b shows that students of the two universities spend between 8-10 per cent of their pre-entry expenditure on acquiring the prospectus of the institutions, while the cost of registration at the University of Lagos is 31 per cent of the pre-entry costs. This is quite high compared with the amount paid by NOUN students for the same activity which is just 20 per cent of the pre-entry stage activities. One fact that also emerges glaringly from the table is that the NOUN students bear a higher cost of communication with the institution than the students of the University of Lagos. This is seen in the figures for telephone and web/emails; where the cost of internet access for UNILAG students is eight per cent of the total fees paid at this stage and that of NOUN is 20 per cent of the fees paid at the same stage.

Entry-stage (while studying)

Table 4c. Average private expenditure related to studying entry stage

Items Entry stage (while studying)	N (UNILAG)	%	N (NOUN)	%
a) Purchased additional books for the course	25,000	23.4	10,000	13
b) Private coaching	10,000	9	5,000	7
c) Viewing audio/video/CDs	-		2000	2
d) Purchased audio/video/CDs	5,000	4.5	5,000	7
e) Stationery items	10,000	9	6,000	8
f) Expenditure on attending teleconferencing	-		2,000	2
g) Attending counselling sessions	-		2,500	3
h) Expenditure on submission of assignments	12,000	11	8,000	10
i) Expenditure on collection of corrected assignments	-		2000	2

j) Project preparation	4000	4	-	
k) Expenditure on library reference	-		2000	2
l) Expenditure on practical sessions	15,000	14	10000	13
m) Telephone	2000	2	2,500	3
n) Fax (hire)	-		-	
o) Web/Email (hire)	2000	2	2,500	3
p) Submission of examination form	-		-	
q) Examination fees	20000	18	12,000	16
r) Transportation	2000	2	5000	7
s) Professional fees	-		-	
Total	107,000	100	76,500	100

Table 4c presents the analysis of the students' expenditure on their programmes after they had secured admission into the programmes. Comparisons of the various expenditure heads reveals there are a number of private costs involved in pursuing the programmes even after they had gained admission into the institutions. This is even more so for distance learners who could not avoid the costs associated with certain expenditure heads such as communication and travelling to the study centres etc.

Further, it is generally presumed that the private costs associated with learning through the distance learning system are significantly lower than those associated with studying through the conventional education system. The intent of this is to provide empirical information to founders of higher education in Africa, who show a great deal of reluctance because they are not aware that they could fund higher education for a larger number of people more effectively if they encourage them to access the open and distance learning system. While education sponsors show a great deal of concern regarding the sponsoring university students because the bursaries and scholarships never seem to be sufficient, it is possible to significantly reduce the shortfall associated with this.

As can be gleaned from the data in Table 4c above, the average learner enrolled for bachelors programmes in computer science or English studies at the University of Lagos is likely to spend about N156, 000 by the time he has completed the first year of the programme; while at the National Open University of Nigeria, a student enrolled for the same programme would spend about N101,000 by the end of the first year.

Discussion and conclusions

The results of the study corroborate the findings of earlier researchers (Hulsmann, 1997; Perraton, 2000, 2003; Psacharopoulos, 1978) on the issue of private costs of education - that students who are engaged in educational activities also bear a significant proportion of the expenditure associated with their studies. Though, in most developing countries, provision of higher education tends to be state funded, however, there is a neglected aspect of this funding. This includes costs of enquiries, application, transportation etc., all of which add up to the total cost of education (Belawati, 2006). It is interesting to note that many educational planners and policy makers tend to ignore this crucial aspect of educational access and equity. Even if the higher education system is completely free of tuition (which it is not), there are still some costs that the institution cannot easily bear for the learners, especially those associated with commuting to and from the learning centres in the case of distance teaching institutions. In many cases students are required to pay stipends for accommodation as in the case of conventional learners. Due to income differentials, it is realistic to assume that none of these costs are significant. Thus, as the above analysis suggests, students of both conventional and distance learning institutions bear significant private costs associated with their learning, apart from the institutional (social) costs which are borne by the government.

Perhaps due to the fact that distance learners do not have to pay for so much extra tutorials and accommodation, their private costs tend to be lower than those of conventional students. Also the findings of Perraton (2000) and Belawati (2006) on the same issue proves that distance education is a much cheaper means of human resource development. This justifies the existence of the distance education institutions and, given the low ratio of marginal average costs, its expansion. In organizing only distance learning institution it has been generally found that the more students are enrolled for the programmes of the institution the less expensive it becomes to operate. There is allowance for students to register for only the number of courses he or she can handle at a given point in time. This has serious pedagogical implications in the sense that it allows the student to study qualitatively without the intervening psychological factors caused by socio-economic inadequacies or obligations to the institution – a fact that can affect students' academic performance. In essence, the opportunity to self-pace their studies and also make payment in affordable tranches offered by distance learning would enable learners to concentrate on their studies better. They do not need to excise concern about how to raise funds to complete their tuition fees or lose their studentship, since they will only need to pay for the courseware that they can afford at a given time.

The findings of the present study indicated that there were significant costs borne privately by learners in both the conventional and the distance learning systems. It was also found that the distance learning system is significantly more cost efficient than the conventional learning system, in terms of private costs of borne by the learners. To sum up, the cost evidence indicates that students and/or their parents expend a significant volume of money on the acquisition of higher education. This is different from the proportion borne by the student and or the state which is usually recorded by costs analysts. This study has attempted to crystallize the study of cost analysis of distance education with particular emphasis on the impact of private costs. In many cases, most providers of distance education are not aware of the actual total cost of their programmes in terms of including the private expenditure. This study has helped to provide a more lucid explanation of the cost implications of education at the university for would-be scholarship agencies and bursary awarding organizations such as state governments and local governments.

Given the centrality of distance education in the whole educational architecture in Nigeria, it is recommended that a practical approach should be adopted in crafting educational policies in Nigeria. The potentials of the open and distance learning methods in further development of the Nigeria human resource both for pre-service and in-service education should be seriously considered with view to centralising ODL as part of all human capacity development activities in the country.

It is also suggested that every distance education institution in Nigeria and other developing world should attempt to do a unit cost analysis of their programmes including a component on private costs of distance learners. This would guide them in further programme evaluation activities which are designed to assess the effectiveness of the learners that enrolled for their programmes.

Open of the recommendations that has also emanated from this study is that scholarship agencies and funding organizations should explore the open and distance learning system more so that can eliminate other costs that are not usually accounted for within their funding budget. From the analysis in this study, it was found that private costs of distance learner tend to be significantly lower than those of conventional students thus an agency that provides funding for learner through the distance learning method will expose the recipients of their awards to less private expenditure than if they had enrolled in the conventional university system.

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UNIT 8:

COSTING OF DISTANCE LEARNING: A STUDY OF THE INDIAN MEGA OPEN UNIVERSITY

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Abstract: The purpose of this study was to analyse institutional costs, private costs, and total unit costs of selected professional programmes offered through distance learning by the Indira Gandhi National Open University (IGNOU), the mega open university from India. The findings of the study (conducted for professional degree programmes of BCA, MCA, and MBA) suggest that while the institutional cost was highest for the MBA programme and private cost was highest for the BCA programme, MBA had the highest total unit cost and the lowest unit private cost. The findings have been discussed with implications for policy makers to determine students' fee and address the issue of private costs while offering programmes through distance learning.

Keywords: *Costing, distance education, professional programmes, institutional cost, private cost, distance learning in India.*

Introduction

For both public and private educational enterprises, cost and costing assume considerable importance. Institutional and student costs depend on a variety of factors, and vary across institutions. In case of programmes offered through distance learning, costing generally depends on: (i) the funding policy (Smith and Bramble, 2008; Panda and Gaba, 2008), (ii) the delivery method of distance learning, and (iii) the economic model the institution adopts for offering their respective programmes. Rumble (1997) has extensively discussed various issues involved in cost analysis for design of courses, use of media, student support services, and also comparison of costs of distance and traditional (conventional) education system, and financing of distance education. In recent years, information and communication technology has increased the offer of distance learning programmes, particularly those programmes which are being offered through online or e-learning mode. Hence, costs for traditional distance learning courses and online courses have shown significant differences. Another important factor is that increase in student number reduces the unit cost. Therefore, it is imperative for institutions to undertake comparative studies on institutional and student costs for distance learning at regular intervals so as to inform decision-making and facilitate the distance learners.

Costs incurred at the institutional level are called 'institutional costs'. The institutional cost categories include: (a) fixed and variable costs and fixed costs, (b) recurring and non-recurring costs, and (c) current and capital costs. Generally, in case of formal classroom teaching, teaching costs are treated as variable costs and are directly related to the output of learners. Also, fixed costs (i.e. those that are not directly related to the output), in relation to total costs are, higher in case of classroom teaching when compared to that of open and distance learning (ODL). Unlike classroom teaching, in ODL expenditure is incurred on variety of activities including printing of learning materials, production of audios and videos programmes, utilization of other ICTs, and provision of learner support. Therefore, cost calculation in the ODL system is based on various activities associated with design, development and delivery of various educational and training programmes.

Student costs or private costs are those costs of education that are incurred by a learner or his/her parents and guardians. These costs are of two types: direct and indirect. Direct costs are visible, like expenditure on tuition fees, purchase of books, transport, etc. Indirect costs are those which are not directly visible, called opportunity costs or foregone earning.

In the present research, we had analyzed institutional costs (recurring cost) and student costs (direct cost) for three professional programmes being offered by Indira Gandhi National Open University (IGNOU), the Mega University of India. IGNOU started operation since 1986, and offered two academic programmes (in management and distance education) with 4528 students in 1987. The number has increased to 468 programmes and about 3 million students in 2011. The university has two major functions: it functions as an open university, as also acts as the apex national accrediting body for distance education in the country operationalized through the Distance Education Council located at IGNOU. Though the university has a cost model available for programme design, development and delivery (Pillai and Naidu, 1997a), there exists only a few studies on this area which restricts facilitation of contemporary decision making on funding and expenditure. The present study is a noted contribution towards this direction.

Review of literature

Studies conducted in this area in India, through a few, pertain to analysis of sources of income and expenditure of the system, and unit cost analysis in relation to the operations of the ODL system. Some studies indicated that the major source of finance in the ODL institutions was 'student fees', and sometimes funds raised through grants from other sources (Biswal, 1979; Sahoo 1985; Datt, 1994; Gaba, 1997). In respect of costing of distance learning, Pillai and Naidu (1997b) analyzed the unit costs of IGNOU (a single mode university) and found that faculty salary consumed the major portion of the cost, and that economies of scale could be maintained up to an enrolment of figure 300,000 students. In the studies conducted on dual mode university (DMU) distance education, it was found that unit costs of correspondence courses were much lower than those of the regular courses (Pandey, 1980; Ram 1984; Gupta, 1985; Gaba, 1997). Datt (1988) pointed out that both unit cost and state subsidy were lower in the case of ODL compared to classroom education (or, the formal system). The per student cost of distance education was merely 15 to 20 per cent of the cost in the formal system (Ansari, 1987). In another study, Datt (1994) calculated the break up of costs in terms of academic costs, non-academic costs and other costs, and concluded that the largest variance was found in academic costs in different correspondence institutions in India. Further, Datt and Gaba (2006) found that the per student cost of dual-mode distance teaching institutions was less than the single mode distance teaching institutions in India due to the former not adopting proper pedagogy of the distance education system.

In another study on a dual-mode institution, Kishore (1997) indicated that the University of Madras was highly cost effective from the point of view of the society. The significant feature was that the major proportion of the cost was recovered through student fee (which is private cost), thereby making the system highly economical. A study at IGNOU on cost analysis (including private cost) of different programmes, Naidu (2001) found that on an average the Master of Computer (MCA) students spent the maximum, followed by B.Sc., B.A. and PG Diploma in Higher Education students. Kulindia Swamy (2002) analysed the capital and operating costs of IGNOU and found that capital expenditure on buildings and campus development had got reduced over the past years. On the other hand, expenditure on equipment, furniture and library had increased. The study also suggested that expenditure on development and production of course materials remained almost constant at the level of 28 percent, though the percentage expenditure on student support services almost doubled from 29.8 percent to 57.48 percent. The salary component was only around 25 percent of the total recurring expenditure from the period 1990-91 to 2000-01. In the years 2001-02 and 2002-03, this further declined to 20 percent and 18 percent respectively. The study concluded that the share of costs on development, production and maintenance of courses accounted for about 30 percent, whereas the remaining costs were shared by student support services and overheads. The delivery costs were expected to be met from the student fees, and the rest could be subsidized through government funds and other internal resources (Naidu, 2005).

Studies conducted by international scholars on different aspects of economics of open and distance learning indicate that the researchers had adopted different sets of cost functions in their respective institutional cost studies. Wagner (1972) found that the United Kingdom Open University (UKOU) produced undergraduates at about one fourth the costs of the conventional universities. Further

studies on the same theme indicated that they produced graduates at something over half the cost of other universities during 1981. The distance education programmes in both Sri Lanka and Indonesia were significantly of lower cost than the classroom conventional teaching (Nielsen et al., 1991); and the Allama Iqbal Open University achieved graduate unit cost that was 45 to 70 per cent of the graduate cost of the conventional universities (Neil and Roberts, 2004). Richardson (2006) in a comparative costing on pre-service (conventional) and in-service (distance learning) teacher training programmes found that the unit costs were lower for distance learning than for the conventional programme. Mensah (2006) in an analysis of the cost efficiency ratio at school level in Namibia found that the distance education system was more efficient than the conventional system. In a study at secondary school level, Rumble (1998) found that the traditional system was less expensive than the ODL system where lesser number of students were enrolled.

Rumble and Koul (2007) in a recent comparative study on cost of open schooling examined the issue of cost-benefit of the National Institute of Open Schooling (NIOS), India and the Namibian College of Open Learning (NAMCOL). They found that both the institutions had strong government support in terms of grants. In case of NIOS, the government grant declined gradually from 34% of its income to meet only 10.01% of its expenses (during the period 2002-2007). The study further found that at the level of secondary education in India, ODL operations such as by NIOS are significantly less expensive than the conventional schooling system. On the other hand, in the Namibian case funding was based on the principle that provision of secondary education via NAMCOL should not be more expensive than providing secondary education via formal system. The study confirmed that NAMCOL economically was very efficient (i.e. in terms of its unit costs per student) in comparison with the formal system. The study concluded that open schools can be either a complementary or an alternative system to the conventional school system in the developing countries.

Studies conducted on various aspects of costing of various media in education (Wells, 1976; Jamison et al, 1978; Eicher, 1980; Perraton, 1982; Fwu et al., 1992; Chambers, 1994; Bates, 1994) suggested that the production costs were higher for film based programmes and lower for radio based programmes; fixed costs for transmission were much higher for television than for radio; audio cassettes were likely to be cheaper than radio where the viewer ship was restricted; and that the cost structure of open and distance learning differed from traditional classroom teaching. Wagner (1972) and Mace (1978) pointed out that these costs could change significantly if the media mix is changed. Eicher (1982) summarized the factors which affect cost levels in media-based distance-learning programmes, and pointed out that the design and production costs are generally much higher than the costs of transmission and reception. On the other hand, radio has an advantage over TV and other media in relation to size of the audience. Charbonneau and Cunningham (1993) found that at Athabasca University video-conferencing resulted in three types of saving: travel costs, 50 percent reduction in instructional time and costs, and an increase in faculty productivity due to non-travelling. Stammer (1995) analyzed the cost of computer-based training in comparison to classroom-based training, and reported that the cost per student of computer-based training was roughly half the cost of computer-based training.

There are some studies conducted to assess the cost-effectiveness of online education. These studies reported that online teaching was more cost-effective than classroom teaching mainly due to the potential of the former to deliver courses to a larger number of students. The development of online courses by both traditional campus based and ODL institutions has raised many questions concerning the costs of online teaching. Hulsmann (2000) found that costs were forty times as much to produce interactive multimedia materials as in print. The author stated that marking of assignments had the highest unit cost in case of one-to-one communication; and tutoring through video-conferencing was having higher per student cost than classroom tutoring. On the other hand, Jung (2005) found that online teacher training was more cost-effective than classroom teacher training, mainly due to the lower opportunity cost of the participants. She concluded that the total cost of online training was approximately 59 percent that of face-to-face training when learners' opportunity costs were included. The cost per enrolled student of online training was approximately 43 percent that of classroom training. In another study, Belawati (2006) estimated the costs for academic activities which consisted of: learner support (44%), course development (36%), student assessment and evaluation (13%), and research (7%).

In the context of online learning and training, Inglis (2008) remarked that if any institution is planning to shift to online learning it may not offer a guarantee of reduction in costs especially due to high delivery costs. On the other hand, virtual universities also need to find ways of reducing costs per graduate by also improving the graduate/course completion rate (Jung, 2008).

The foregoing review of related studies suggested that the ODL system generally is found to be more cost effective in comparison to the traditional classroom system of teaching, and therefore has the advantage of economy of scale. In India, there has been a dearth of studies on especially media-intensive distance learning. The review also reveals that most of the studies were conducted on cost comparison between distance and conventional education systems, unit costs, and funding patterns of distance education. Very few attempts have been made to estimate *institutional costs* and *students costs* together within the ODL system. The present study attempts to address this in a mega open university, i.e. IGNOU.

Objectives of the study

The objectives of this study were to:

- estimate the institutional costs (i.e. recurring costs) for three selected professional programmes: Master of Business Administration (MBA), Master of Computer Application (MCA), and Bachelor of Computer Application (BCA) offered at the National Open University in India;
- find out the student costs (i.e. private costs) for MBA, MCA, and BCA programmes; and
- estimate the total costs (institutional and student costs) for MBA, MCA and BCA programmes.

An implicit objective of the study was to deduce implications for policy decisions in respect of professional programmes at the mega open university.

Research design

The study was based on primary and secondary sources of data. Published and unpublished documents of IGNOU were used for analysis of data. For institutional cost, the main focus was to analyze the existing data, i.e. IGNOU's published annual budget for the year 2003-04, i.e. the year for which Bachelor in Computer Application (BCA), Master of Computer Application (MCA), and Master of Business Administration (MBA) enrolments were considered for analysis. Due to non-availability of sub-head wise financial data for various programmes, calculation (on the basis of information available in the institution and the concerned schools of studies) was done by taking into consideration the programme-wise recurring cost of selected items at current prices. For calculating student cost (i.e. private costs), the survey technique was adopted. For this, a student questionnaire was developed which consisted 16 items on private cost e.g. (a) registration fees, (b) additional books, (c) stationery items, (d) private coaching (additional tuition), (e) transportation, (f) preparation of assignments and project, and (g) use of web/telephone/internet. For estimating student costs, 400 learners enrolled in three programmes namely MBA, MCA and BCA in the year 2003-04 were randomly selected, and the private cost questionnaire was dispatched to all the 1200 sampled students during May, 2006 (Table 1). The sample was selected with due consideration to their location (i.e. regional centres) and gender (i.e. male and female). Those three programmes were selected because of their professional nature and that there were great demand for such professional in the market. Out of a total of 1200 questionnaires dispatched to the sampled students in 2006, 206 complete sets were received back (i.e. an average of 17% response rate, varying from 9% for BCA to 31% for MBA). In 2006, the BCA students had completed two of the three years of study, and MCA and MBA students had completed their two years of study.

Table 1: Sample size and response rate

Programme	Number of students enrolled (2003)	Questionnaires dispatched (2006)	Filled in questionnaires received	Response rate
BCA	20,914	400	36	9%
MCA	15267	400	48	12%
MBA	15216	400	122	31%
Total	151397	1200	206	17%

Methodology for cost estimation

Scholars vary in their opinion in respect of methodologies adopted for cost calculation. Jamison et al. (1978), Mack (1978), Rumble (1997), Hulsmann (2000) and Naidu (2001) defined costing models based on the operation of the Open University system and student costs. Rumble emphasized on activities-based costing, well accepted in the literature on costing and instructional technology. Two

case studies conducted by Bartolic-Zlomislic and Bates (1999) and Bartolic-Zlomislic and Brett (1999) used costing models such as (i) capital and recurrent costs, (ii) production and delivery costs, and (iii) fixed and variable costs. The cost structure of each technology was analyzed and the unit cost per learner was measured.

There are various factors which are responsible for estimated cost in ODL. Since distance education maximizes accessibility to educational opportunities, a variety of media, like print material, radio, TV, CDs, Internet, telephone and fax are used for imparting instruction. The costs of teaching through different media vary mainly due to the influence of factors like fixed and variable costs, the composition of which significantly varies across different media. For instance, fixed costs are much higher for TV than for radio. It can be lowered if existing broadcasting installations are used. In addition to these variables, the organizational structure of an open university is an important factor, which affects the costs within the ODL system. In case of small audience size, small media like slide projector or tape recorder have greater cost advantages than the big media like TV and computer based instruction or Internet.

It is prudent to conclude that the cost of ODL depends on the extent of the utilization of resources, the type of technology used, the size of enrolment, and the number of courses offered. It also depends on the quality and quantity of paper used for print media, the quality of equipment used for the electronic media and the extent of use of multimedia in case of computer-based instruction.

Total costs of ODL programmes

The sum of student costs and institutional costs is called the total costs of an educational programme. Institutional costs include recurring and non-recurring expenditure on different items. It can be summarized in the form of the following equation:

$$TC = C_s + C_i$$

Where,

TC = Total costs

C_s = Student costs

C_i = Institutional costs

The following variables were taken into account for calculation of institutional (recurring) cost in the present study:

- Expenditure on printing of self learning materials;
- Salary of academic and non-academic staff;
- Expenditure on delivery of self learning materials; and
- Remuneration paid to the evaluators for evaluating assignments and term-end answer scripts.

Student (private) cost was calculated on the basis of students' actual expenditure on: (a) registration fees, (b), (c) additional books, (d) stationery items, (e) private coaching (additional tuition), (f) transportation, (g) preparation of assignments, and project, and (h) use of web/telephone/internet.

Limitations for the present study

This study was based on some limitations. We estimated recurring institutional costs only for one year i.e. 2003-04. This year was selected because of the availability of actual data at current prices. The actual number of students who were enrolled in all the three programmes for this year were taken into account for calculation of the total institutional expenditure. We assumed that all the students had started their study in their respective programmes immediately after enrolment. We could not include fixed costs and capital costs (including expenditure on audio/video and other ICTs) of these programmes because of non-availability of categorical institutional data. Hence, we analyzed the cost of printed material only. The number of courses (1 course = 5 to 6 credit, 1 credit = 30 student study hours) varied from programme to programme. For estimating the programme-wise cost, we had chosen the first eight courses of each programme for uniform analysis, because students had to complete two semesters comprising 8 courses in a year in each of the three programmes.

The recurring cost for MBA, MCA and BCA programmes did not include expenditure on television broadcasts, teleconferencing, audio and video programmes, and counselling at study centres due to non-availability of data on programme-wise expenditure. Expenditure on conducting term-end examinations was also not estimated because the examinations were conducted together for all the programmes (about 125 in that year at above 3000 exam centers) of the university including the three programmes analysed in the present study. Expenditure on printing of assignments, production of audio/video/teleconferencing/interactive radio counselling was also excluded for the three programmes due to the same reasons. As already noted for students' cost, we had calculated direct costs only.

Results

i) Institutional data analysis

Expenditure on staff salaries

The expenditure on salaries of teaching and non-teaching staff of all the three programmes was estimated on the basis of the then existing actual pay scales of the staff in 2003-04 at current prices. The allowances and other benefits were also calculated by multiplying the number of staff existing at respective schools of studies of IGNOU during the same year. Expenditure on salaries of the teaching staff was calculated on the basis of the existing number of faculty members, i.e. lecturers, readers and professors who were on the job in 2003-04 and were coordinating their respective programmes. The minimum gross salary (i.e. basic pay plus allowances) was taken into account while calculating the total expenditure on teaching staff which was Indian Rupees 349.9 thousand. The School of Management Studies of IGNOU was coordinating two programmes, i.e. Commerce, and Management Studies in 2003-04. The allocation of teaching staff in the School was as per each programme (discipline-wise), which was not the case for support staff (those who were providing support across programmes within the school). Therefore, expenditure on the salaries of non-teaching staff was calculated as a proportion of the total expenditure (actual) on salaries of such staff incurred during 2003-04. We adopted the 'percentage of courses' approach to calculate the expenditure on salaries of the non-teaching staff (see Table 2) by assuming that the staff helped the faculty in maintaining the courses. Hence, the total expenditure on non-teaching staff for the MBA programme was calculated proportionally as a share of the percentage of courses. We had taken into consideration for MBA 75% of the total salary of the non-teaching staff during 2003-04 and (which was Rs.121.8 thousand).

Table 2: Share of courses of commerce and MBA programmes

Discipline	No of courses	% of courses
Commerce	17	25
MBA	52	75
Total for the discipline	69	100

Similarly, recurring expenditure on salaries of staff of BCA and MCA programmes was calculated on the basis of percentage share of courses (as was the case for MBA programmes). The School of Computer and Information Science was running three programmes in 2003-04: Bachelor of Computer Application (BCA), Master in Computer Application (MCA), and Certificate in Computing (CIC). Therefore, we had given weightage to BCA and MCA on the basis of their total number of courses for calculating expenditure on the cost of salaries of the non-teaching staff (see Table 3).

Table 3: Share of courses of MCA and BCA programmes

Programmes	Courses	%
MCA	31	49
BCA	27	43
CIC	5	8
Total for the programmes	63	100

All the faculty members were maintaining the courses of the three programmes every year. Therefore, the expenditure on the salaries of teaching staff was calculated on the basis of the percentages of courses. The total expenditures on the salaries of the teaching staff of BCA and MCA programmes were calculated to be Rs. 115.9 thousand (MCA) and Rs. 101.7 thousand (BCA) respectively.

Expenditure on non-teaching staff was also calculated based on the same method: Rs. 75.6 thousand for MCA and 66.3 thousand for BCA.

Expenditure on printing of self-learning materials

A clarification on terminologies used for programme and course is needed before proceeding to present the cost analysis under this head. A programme refers to the curriculum or combination of courses in a particular field of study (e.g. certificate, diploma and degree). It is used to describe the teaching materials (print and non-print) and other components of study (counselling, assignments, projects, hands-on if any). A course consists of a number of booklets (or blocks/modules) of printed material, and also associated audio and video materials. As mentioned earlier, a course may be of 4, 6, 8 credits where 1 credit is equal to 30 student study hours. The block appears in the form of a booklet (textbook) of around 60 to 85 printed pages. Generally each block presents one combined theme. There are 3-5 units in a block, and each unit is of 4000- 6000 words. There have been deviations to this word limit depending on the requirement of an individual course. The expenditure on printing of self learning materials (SLMs) was calculated on the basis of expenditure per block. As mentioned earlier, the development cost of SLMs had been excluded in the present context. The printing cost of blocks was calculated on the basis of information provided by the Material Production and Distribution Division (MPDD) of IGNOU as per their prescribed formula (see Appendix 1). The cost of each block was calculated as per their formula and it was found, on an average, to be Rs. 212.12 during 2003-04. We assumed that all one-year programmes contained 8 blocks. The expenditure on printing of study material of all the programmes was calculated in 2003 on the basis of: the number of students enrolled in the respective programme X Rs.212.12 X number of blocks (i.e. 8). In each of MBA and BCA programmes, there were 32 blocks in total in comparison to 36 blocks in the MCA programme. The total expenditure on SLMs was Rs. 17213.7 thousand for MBA, Rs. 14136.6 thousand for MCA, and Rs. 12523.9 thousand for BCA.

Expenditure on delivery of self-learning materials

As mentioned earlier we estimated expenditure on the basis of eight courses for each of three programmes. Therefore, the delivery cost was calculated on the basis of the actual per package postage costs i.e. Rs. 50 per packet during 2003-04. Each eight credit course was sent to the students in two packets). Therefore, we assumed that all the 8 blocks of all the three programmes were dispatched in six packets. Hence, the per student dispatch cost was Rs. 300 (Rs. 50 X 6 = 300). The total expenditure on delivery of SLMs for each programme was calculated on the basis of: number of students X per student dispatch cost (which was Rs. 627.4 thousand for MBA, Rs. 458.0 thousand for MCA, and Rs. 380.4 thousand for BCA).

Expenditure on evaluation of assignments

The requirement of assignments to be done by a student varied from programme to programme. For the MBA programme each student had to submit three assignments as per IGNOU norms in 2003-04 of which the best two were considered for inclusion of grades in the final grade card. Therefore, we had considered two assignments per course while calculating the total expenditure on evaluation of assignments. Hence, the total expenditure was: 16 assignments (8 courses x 2 assignments) X per assignment rate (@ Rs 15 per assignment) X number of students enrolled in each programme, which was Rs. 501.9 thousand. Similarly, in the MCA programme each student had to submit 12 assignments in a two-semester course and the total expenditure was Rs. 274.8 thousand. For the BCA programme, each student had to submit four assignments in a year for two semester courses, and the total expenditure incurred was Rs. 91.2 thousand.

Expenditure on evaluation of answer sheets

The expenditure on evaluation of the answer sheets of the term-end examinations was calculated for all the three programmes on the basis of: number of students enrolled in 2003-04 for each programme X 8 courses X Rs. 15 (i.e. the rate of payment for evaluation of one answer scripts). The total expenditure was Rs. 251.9 thousand for MBA, Rs. 183.2 thousand for MCA, and Rs 182.5 thousand for BCA.

Total recurring expenditure

It may be observed from the above analysis that the major recurring expenditure for all the three programmes was on printing of self learning materials (more than 90%), followed by dispatch of these materials to the students (about 3%). The expenditure on other items was much less than the printing and delivery costs (Table 4). Due to non availability of baseline data we had excluded the expenditure on students support services which included expenditure on counselling and the development and telecasting/broadcasting of radio/video programmes. If these recurring expenditure were included in our analysis, then the percentage of printing and delivery expenses of the SLMs to the total recurring expenditure would have been lower.

(ii) Student costs

For calculation of student costs, we obtained information directly from the students on the expenditure which they incurred on their respective programmes while studying at IGNOU. A structured questionnaire consisting of 16 questions relating to the objectives of the study was developed and posted to randomly selected students enrolled in the three programmes during May, 2006 (400 students of each programme). Of the total 1200 students, 206 students (17%) sent back filled-in questionnaires.

Table 4: Item-wise expenditure for all the programmes (Rupees in ,000)

Sr. No.	Items	MBA		MCA		BCA	
		Amount (In Rs.)	%	Amount (In Rs.)	%	Amount (In Rs.)	%
1.	Salary of the teaching staff	349.9	1.84	116.0	0.76	101.8	0.76
2.	Salary of the non-teaching staff	121.8	0.64	75.6	0.50	66.3	0.50
3.	Printing self learning material	17213.7	90.29	14136.6	92.73	12523.9	93.84
4.	Delivery of self learning material	607.4	3.29	458.0	3.00	380.4	2.85
5.	Evaluation of assignments	501.9	2.63	274.8	1.80	91.2	0.68
6.	Expenditure on evaluation of term-end examination sheets	250.9	1.32	183.2	1.20	182.5	1.37
	Total	19065.8	100.00	15244.2	100.00	13346.1	100.00

Profile of the respondents

- On an average, most of the respondents (63%) belonged to urban areas; were male (80%); in the age group 26-30 years (57%); and married (59%).
- More than 75% of respondents of the BCA programme were unmarried in comparison to those in MCA (58%) and MBA (68%) programmes.
- More than 95% respondents of the MBA programme were employed in comparison to those in BCA (63%) and MCA (43%) programmes.

We had calculated the student cost on the basis of information provided by them. Their expenses were categorized into three stages at which each student incurred some expenses while studying through the distance education mode: (a) pre-entry stage; (b) study stage; and (c) post-study stage (Table 5).

In addition, a few students (2% of the total respondents) visited study centers, regional centers, and the head quarter for personally collecting study materials which did not reach them by post. We did not take this into account while calculating the student expenditure because responses to this item were very few. Hence, the total student cost (at all stages) was calculated for all the three programmes for items like: (a) transportation (for purchasing and submission of registration form, attending counselling sessions, submission of assignments, appearing in term-end examination); (b) registration fees; (c) private coaching; (d) purchase of additional books; (e) stationery items; and

(f) telephones/browsing web mails. The information provided by the students was heterogeneous; it varied from student to student. Therefore, we had calculated expenditure incurred on the average each item during the three stages of their study at IGNOU.

Table 5: Stages of student's expenditure while studying through distance mode

Pre- entry stage Expenditure incurred by a student on: ▪ Prospectus ▪ Registration fees ▪ Transportation (visited study centre/ regional center for purchasing prospectus, admission enquiry etc.) ▪ News paper for advertisement ▪ Browsing web/email	Study-stage Expenditure incurred by a student on: ▪ Purchase of additional books ▪ Private coaching (wherever intended) ▪ Stationery items ▪ Transportation (for submission of assignments/project reports, to attend counselling sessions etc.) ▪ Project preparation
Post-study stage Expenditure incurred by a student on: ▪ Transportation if needed (for visiting study center/ regional centers / and head quarters for collecting assignment results and not-incorporation of assignments and project marks in Grade Card, and filling the registration form for the next semester etc.	

Pre-entry stage

On an average, students of the BCA programme spent more (Rs. 17,816) in comparison to MCA (Rs. 16,701) and MBA (Rs. 8,601) students during the pre-entry stage (Table 6). Most of the students of all the programmes spent about 67% (and above) of their total expenditure on registration fees before entering into their respective programmes. The students of the MBA programme spent the highest (16.16%) on transportation (for obtaining prospectus and submitting registration fees) in comparison to the students of BCA (12.85%) and MCA (8.49%) programmes. The students of the MCA programme spent more (16.12%) on browsing IGNOU's web page and accessing their emails than the students of BCA (5.00%) and MBA (4.07%) programmes.

Table 6: Programme-wise (pre-entry stage) student costs (In Rs)

Items	MBA		MCA		BCA	
	Amount	%	Amount	%	Amount	%
Transportation	1429	16.61	1418	8.49	2290	12.85
Registration	5810	67.55	11461	68.62	13074	73.38
Prospectus	385	4.48	70	0.42	340	1.91
Web/Email	350	4.07	2692	16.12	890	5.00
Others	627	7.29	1060	6.35	1222	6.86
Total	8601	100.00	16701	100.00	17816	100.00

Study stage

Table 7 indicates that most of the MBA students spent more (52.06%) on transportation in comparison to MCA (33.27%) and BCA (23.63%) students during the entry stage. As noted earlier, we had excluded the expenditure on viewing audio and video programmes, submission of examination form and receiving study materials while calculating the transport cost because most of the students did not respond to this item. The students of the BCA programme spent more (25.41% of their total expenditure) on private coaching during the entry stage in comparison to MCA (21.60%) and MBA (4.09%) students. Among all the three programmes the BCA students spent more (Rs. 20,139) in comparison to MCA (Rs.19,940) and MBA (Rs.14, 753) students while studying at IGNOU (Table 7).

Table 7: Programme-wise (entry stage) student costs (In Rs.)

Items	MBA		MCA		BCA	
	Amount	%	Amount	%	Amount	%
Purchase of additional books	1774	12.02	2895	16.14	2804	13.92
Private coaching	603	4.09	3875	21.60	5117	25.41

Stationery	1476	10.00	1533	8.55	2002	9.94
Transportation	7680	52.06	5969	33.27	4758	23.63
Project/assignment preparation	2758	18.69	2348	13.09	3408	16.92
Web/email/telephone	462	3.13	1320	7.36	2050	10.18
Total	14753	100.00	17940	100.00	20139	100.00

Post-study stage

During the post-study stage most of the students of all the three programmes spent money on transportation. The students of the MCA spent more (Rs. 2008) in comparison to the BCA (Rs. 1790) and the MBA (Rs. 1289) students. They visited SCs/RCs/HQs for the following reasons:

- obtain the results of their respective programmes (52%);
- find out the delay in the despatch of the Grade Card (26%);
- find out non-incorporation of the assignments grade in the final Grade Card (38%); and
- Submit registration form for the next course (64%).

Student cost at all stages

We had calculated students' total expenditure on items like: (a) registration fee; (b) transportation; (c) prospectus; (d) purchase of additional books; (e) private coaching; (f) assignment/project preparation; and (g) stationery items.

The expenditure by BCA students (Rs.39,745) was higher than that of the MCA (Rs. 36649) and MBA (Rs. 24633) programmes (Table 8). The major proportion of expenditure of students of the BCA students (Rs.13, 074) and MCA (Rs.11, 461) programmes was on 'registration fees' comparison to the MBA (Rs. 5, 810) programme. It is understandable because the BCA was a three year programme. It is interesting to note here that most of the students of the MBA programme incurred more expenditure (42.19%) on 'transportation' for visiting SCs/RCs/HQs than the students of BCA (22.24%) and MCA (25.63%) programmes (Table 8).

(iii) Total costs

As was already noted:

$$TC = C_i + C_s$$

Where, TC = Total cost

C_i = Institutional costs

C_s = Student cost

Table 8: Total student costs (In Rs.)

Items	BCA		MCA		MBA	
	Amount	%	Amount	%	Amount	%
Registration fees	13074	32.89	11461	31.26	5810	23.58
Transportation	8838	22.24	9395	25.63	10398	42.19
Prospectus	340	0.86	70	0.19	385	1.56
Purchase of additional books	2804	7.05	2895	7.90	1774	7.20
Private coaching	5117	12.87	3875	10.57	603	2.45
Project preparation	3408	8.57	2348	6.40	2758	11.19
Stationery items	2002	5.04	1533	4.18	1476	5.99
Others	4162	10.47	5072	13.84	1439	5.84
Total	39745	100.00	36649	99.97	24643	100.00

The total costs of BCA, MCA and MBA programmes are presented in Table 9. It is seen that the total cost of the MBA programme was higher (Rs. 19, 068.3 thousand) than to that of MCA (Rs. 15, 247.8 thousand) and BCA (Rs. 13, 350.1 thousand) programmes.

Table 9: Total costs of ODL programmes (Indian Rs.)

Programmes	Institutional costs (Rs. in million)	Students costs (Rs. in thousands)	Total costs (Rs. in million)	Number of students enrolled in 2003-04	Per student cost (In Rs.)
BCA	133.4	40	133.50	15216	8,774
MCA	152.44	36	152.47	15217	10,020
MBA	190.65	25	190.68	20914	9,117

Conclusions

The following are the summary of the main findings of the present study:

- The recurring expenditure (institutional cost) of the MBA programme was higher than that of MCA and BCA.
- The students of the BCA programme incurred more (private cost) than the students of MCA and MBA programmes.
- The per student total cost (institutional and private) of the MCA programme was higher than that of the MBA and BCA programmes.

One of the objectives of setting up ODL institutions in India was to provide cost effective programmes to those who couldn't get their education due to one reason or another. The above analysis of institutional and student costs has shown that private (student) costs have significant contribution to the total costs of distance learning. This suggests that the financial burden of the ODL system is gradually being transferred to the students. They had to pay for their tuition and other fees and in addition had to spend a significant amount in order to obtain their degrees. Arguably, this is against the objectives of any ODL system which is based on the presence of equality in educational opportunities. In view of the fact that ODL is of crucial importance in ensuring equality of educational opportunity as well as providing education at lower costs especially in developing countries like India, it is imperative for the policy makers and institutional leaders to devise mechanisms whereby either the institutions take care of expenses on a lot of institutional activities from within the collected student fees, or that programme design should be such that students will have flexibility in meeting programme objectives without incurring much from their own purse. Further, even if the findings show that the institutional cost was highest for the MBA programme and private cost was highest for the BCA programme, the total cost was highest for MBA (though the MBA students spent the least of all). This suggests that institutional attempt should be geared towards significant institutional provision towards educational facilitation whereby the students have to spend the least. Student fees for various professional programmes need to be determined in such a way that there is a balance between institutional and student costs, even if at the end of the day the institution can obtain a 'no profit no loss' balance sheet by adjusting the cost structures of various programmes it offers.

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Appendix-1

Expenditure on printing of self-learning materials

1.	Course details	Number/Amount
2.	No. of Pages	124
3.	First edition/revised edition	1 st edition
4.	Cost details (In Rupees) a. Comprising and arts work b. Processing/Scanning c. Plate making d. Lamination (if any)	Rs. 13801.00 Rs. 33451.00 Rs. 7797.00 -
5.	Print Order	1000 copies
6.	Cost of: a) Printing b) Binding c) Packing and forwarding	Rs.6400.00 Rs.224.00 Rs.85.00
7 (i)	<u>Cost of text paper</u> (a) Total reams used: 16 (61x 86cms/70GSM) (b) Cost of text paper @ Rs. 613 per ream (c) Total expenditure on text paper (613 X 16)	Rs. 9808.00
7(ii)	<u>Cost of sheets</u> (a) Total sheets used = 463 (b) Cost of the sheet @ Rs. 1.22 per sheet (c) Total expenditure on sheets (1.22 X 463)	Rs. 546.86
7 (iii)	<u>Cost of art card</u> (d) Total Art Card used= Gross1 (62 x 88 cm) (e) Cost of Art Card @ 739/- per gross (f) Total expenditure on art card (739 X 1)	Rs. 739.00
7 (iv)	(ii) <u>Cost of sheets</u> (a) Total sheets used= 124 (b) Cost per sheet= @ 5.13 per sheet (c) Total expenditure on sheets	Rs. 636.12
	Total production cost (From 4 to 7 (iv))	Rs.73487.98

Source: *Material production and distribution division, IGNOU*

$$\text{Price of per block (textbook)} = \frac{\text{Total production cost} \times 3.50}{\text{Number of copies}}$$

$$= \frac{73487.98 \times 3.50}{1000}$$

$$= \text{Rs. 257.21}$$

Note: weightage price of all the programmes are multiplied by
2.75 times for general programme
3.50 times for post-graduation and professional courses